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Politics of the Soviet Energy Balance: Decisionmaking and Production Strategies

A Research Paper

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*RP 79-10004
January 1979*

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**Politics of the Soviet
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Key Judgments

Soviet leaders, especially those closely in touch with the economy, have been aware since well before the Western oil crisis of 1973-74 that they had a far more serious energy problem than they were prepared publicly to acknowledge. Nevertheless, the year 1977 appears to have represented a watershed in their appreciation of just how serious the problem really is. By that time, the magnitude of the energy transportation problem caused by the rapidly increasing fuel deficit in the European USSR was becoming fully apparent. The immediate reasons for increased anxiety included the deterioration of the ratio of oil reserves to production, the failure of geologists in West Siberia's Tyumen Oblast to meet the plan for increasing oil reserves, the inability to bring on stream the planned number of new small oilfields in Tyumen, shortfalls in production in a considerable number of older oil regions, and energy shortages throughout the economy. At the December 1977 Plenum of the Central Committee, with Brezhnev's endorsement the Soviet leadership significantly altered the energy policy that had underpinned the 10th Five-Year Plan (1976-80) and accelerated development of oil and gas production in Tyumen Oblast.

There has never existed what could properly be called a comprehensive and *operative* Soviet energy program. There have been various studies, recommendations, and forecasts; there have been many research and development (R&D) projects; and there have been compilations of one-year and five-year plan targets that have naturally involved individual capital construction projects with long leadtimes. But energy production decisionmaking has not been seriously influenced by any carefully elaborated and stable "master plan." Nor have there existed operative long-term, integrated programs for attacking such key energy production problems as Tyumen oil development, offshore oil production, Tyumen gas develop-

ment, or Kansk-Achinsk coal development. The process of decisionmaking with respect to these critical production areas is far more ad hoc than is customarily assumed by either Soviet propagandists or many Western analysts.

The center of gravity in energy decisionmaking over the past decade has lain in the Council of Ministers - State Planning Committee (Gosplan) sphere. There is no evidence that the Politburo or the Central Committee Secretariat has routinely taken the initiative in energy production policy matters. Premier Kosygin has been the top official responsible for energy production. Other key figures have included Council of Ministers Deputy Chairmen Vladimir Novikov and Veniamin Dymshits, who have exercised day-to-day supervision of the energy production ministries; Gosplan Chairman Nikolay Baybakov; and Chairman of the State Committee for Science and Technology Vladimir Kirillin. Vladimir Dolgikh, the Central Committee secretary responsible for heavy industry, has monitored energy production along with many other sectors of the economy which fall within his jurisdiction from the party side. On occasion the party Secretariat does intervene in energy production policymaking, as it did most recently in December 1977. Fundamentally, however, power in energy production decisionmaking remains diffused among various leaders and institutions; there is no point at which all the strands of influence come together.

The economic and political system in which energy production policymakers and administrators operate compels them to be highly responsive to short-term considerations at the expense of proclaimed long-term objectives. Top-level policymakers and advisers tend to hedge their bets and avoid unqualified commitment to

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any single policy proposal. They are sensitive to currents of elite opinion and avoid overadvocacy of positions that will isolate them or endanger their bureaucratic or political careers. High-level energy administrators are concerned above all with ensuring conditions that will make it possible to slightly overfulfill the one-year targets for which they are responsible. Consequently, they tend to avoid any technological innovation that threatens to set back annual plan fulfillment.

Top energy policymakers are extremely dependent on advisers and specialists, who provide most of the basic information and play a critical role in defining the options. Unbiased advice, however, is a scarce commodity because most advisers and specialists have vested interests defined by the institutions, research programs, and career systems with which they are associated.

Policy decisions on energy production customarily emerge from a labyrinth of bureaucratic and personal negotiation, in which committee discussion and formal interorganizational coordination play an important role. Within the limits set by circumstances that cannot be ignored, policy is more a resultant of the play of institutional and personal interests than the outcome of a rational appraisal of the objective situation. On the whole, the system tends to respond slowly to new conditions. Although campaigns to meet changing situations are often mounted, incrementalism is a deeply ingrained principle of energy planning.

During the past decade Soviet energy policymakers and advisers have discussed a range of responses to the growing energy problem. The spectrum of options considered runs from (1) simply increasing oil and gas production, to (2) sharply raising the share of gas in the energy balance, to (3) stabilizing and then gradually decreasing the share of hydrocarbons, simultaneously increasing the share of coal and nuclear power, to (4) going all out for coal. The preferences of policymakers and advisers have to some extent shifted with the passage of time. Options 1 and 2 have always been supported by a cluster of party and production officials with a career interest in Tyumen Oblast, backed up by some Siberian scientists. It is possible that these officials have received some encouragement over the years from the Central Committee Secretar-

iat—perhaps even from Brezhnev. Option 3 has been favored in recent years by Premier Kosygin, all the top Academy of Sciences energy advisers, Gosplan Chairman Baybakov, Chairman of the State Committee for Science and Technology Kirillin, some ministers, and party and production leaders in Siberia's Krasnoyarsk Kray. Option 4 has been entertained by some Academy of Sciences figures and supported by certain specialists associated with the coal and electric power industries.

There has been much vacillation and indecision in energy production policy. From a faith that the share of oil and gas in the energy balance would gradually continue to rise, Soviet authorities shifted in the early 1970s to the hope that a big leap in gas production might prove to be the answer; by 1975-76 a broadly based strategy keyed to oil and gas in the present, coal in the middle term, and nuclear power in the longer term was approved as the party line, but by late 1977 policy had changed to embrace a narrower, all-out campaign simply to develop oil and gas production in Tyumen Oblast over the next decade. And even the adoption of the most recent line has not stilled proponents of both the coal-nuclear and gas alternatives. It is likely that Kosygin, Baybakov, Kirillin, and most Academy of Sciences energy advisers were unhappy with the way policy was altered at the December 1977 Plenum of the Central Committee. While they are probably prepared to acknowledge that under present conditions there is no choice but to attempt to accelerate hydrocarbon production in West Siberia, they probably fear that the current campaign will undermine the pursuit of crucial longer range goals.

The change of direction at the December 1977 Plenum of the Central Committee and the retreat from the strategy of the 10th Five-Year Plan indicate the extreme difficulty the Soviets are having in sustaining a balanced response to long-term energy development needs and short-term demands for petroleum. Since 1976 there has been a definite foreshortening of the energy horizon and even greater fixation on meeting today's needs, come what may in the future.

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At the moment the Soviets are engaged in a relentless struggle to *maintain* oil output in the key West Siberian region by increasing drilling and recovery in Samotlor and other older Tyumen deposits, and to *raise* the level of output by opening up smaller Tyumen fields. The prospects for success are highly tenuous. Samotlor, which at present produces about one-quarter of all Soviet oil, is being driven beyond its planned capacity and will thus go downhill more rapidly when it begins to decline in several years. The small fields are in increasingly inaccessible locations, are substantially less productive than Samotlor, and require progressively rising investment. They are not being brought on stream as rapidly as required. The Tyumen campaign may be predicated to some extent upon the hope that one or more new supergiant oil deposits will be discovered either in the Middle Ob region or beneath the gasfields in northern Tyumen. Yet there has been a critical lag in geological exploration of the region and Soviet policymakers consequently lack a sound basis for even guessing whether oil is to be found in these locations. The presence or absence of such oil has been hotly debated. Probably a majority of Soviet experts disagree with those geologists now ascendent who guarantee they can find oil in these places if given the resources.

Over the past decade the Soviet leadership has been unable to force a technological breakthrough in even one type of new system that could provide an answer to the increasingly critical problem of transporting Siberian energy to the European USSR. Given the long leadtimes involved, this failure seriously jeopardizes any possibility—however slight it may now be—of large-scale substitution of gas or coal for oil in the 1980s. Whether Soviet R&D organizations will be able to devise means of chilled or liquefied gas transportation in time to have an effect in the 1980s is highly problematic. Delays in solving the extra-high-voltage transmission problem, in developing either slurry or capsule pipelines, in implementing any one of several proposed coal-processing techniques, and in producing power-generating equipment adapted to Kansk-Achinsk coal now push a possible “coal alternative” well off into the 1990s.

Without a significant increase in the share of investment going to energy production, it is difficult to see how the Soviets can do much to transform the parameters of the dilemma that now confronts them. They must make an increasingly heavy commitment of resources to oil production in Tyumen because they must have the oil; without additional investment being allocated to the energy sector as a whole, this will tend to retard progress toward either a gas- or coal-based solution to the energy problem, and delay in developing these alternatives will generate still more pressure to maintain the existing proportion of oil in the energy balance—despite the day of reckoning that must come unless a new supergiant oil province is quickly discovered. Brezhnev's speech at the November 1978 Plenum of the Central Committee suggests that energy-related investment may be given a higher priority during the remaining years of the present five-year plan. Because the physical resource demands of energy production fall heavily upon the metallurgical, machine-building, construction, and transportation sectors, pressures may mount to make compensatory cutbacks not only in the traditional buffer sectors of agriculture, housing, and light industry, but in military production as well.

The question of foreign dependency has probably become more acute with the introduction of the new party line. The strategy propounded by Kosygin and Baybakov in 1976, with its stress on nuclear power, coal, and hydroelectricity, was presented, in almost so many words, as the Soviet “Project Independence.” The retreat from this strategy in December 1977 may have compromised the longrun objective of avoiding external structural vulnerability in energy matters. By playing down the policy commitment to coal and nuclear power, perhaps to avoid cuts in military or agricultural spending, Brezhnev has implicitly heightened the already urgent Soviet need for a broad range of onshore and offshore oil and gas technology. More important, any slackening in the expansion of coal production and nuclear generating capacity that might arise as a byproduct of the current strategy threatens to leave the Soviet Union in the latter 1980s and in the 1990s with an extremely tight energy situation, if not a serious energy deficit. It is apparently this forbidding prospect of a deficit, not the question of dependence on Western technology acquisition, that has most disturbed Kosygin.

In the future the Soviets are likely to try to revive the gas strategy. Provided gas reserves are even close to being as large as officially claimed, a quantum leap in Tyumen natural gas utilization would be the only way a really rapid increase in fuel production could be brought about. This approach, however, would place an acute strain on the steel and gas and oil machine-building industries. Foreign supply of credits, large-diameter pipes, and compressors might well prove to be even more critical at this juncture than at present.

The Soviet leadership may also search for organizational solutions to its energy dilemma. The most likely prospective courses of action would be the creation of a Politburo-level committee responsible for monitoring energy problems and/or the appointment of a Central Committee secretary responsible solely for energy affairs. But neither change would significantly improve the leadership's capability for dealing with the energy problem.

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Foreword

This paper examines the way in which the Soviets have dealt with energy production issues, rather than quantitative aspects of the Soviet energy question. Given the fusion of political and economic issues and of policymaking and bureaucratic implementation in the Soviet system, there can be no tidy demarcation of the "politics" and "economics" of energy production. Essentially, "politics" occurs wherever there is an element of choice with respect to policy or execution. While such choices are often resolved at the very top, the complex technical nature of energy issues and the strong bureaucratic and personal interests involved create a setting in which outcomes may be significantly affected by what is happening at middle or even lower echelons. [REDACTED]

The present paper complements recent CIA analyses of the Soviet energy situation that have focused on the oil industry. CIA projections of Soviet oil output have provoked considerable debate. They have been questioned less on empirical, technically based grounds than on the grounds that they overlook certain features of the Soviet natural resource and political-administrative environment. It is argued, directly or indirectly, that CIA projections:

- Pay insufficient attention to the vast potential energy resources still untapped in West Siberia, East Siberia, and offshore.
- Fail to recognize the capacity of the Soviet system to reach hard decisions in energy policy and then—through command planning and mass mobilization—to implement them.
- Discount the ability of Soviet planners to diagnose their own energy production problem and come up with a coherent, long-term "rational" energy strategy. [REDACTED]

This study looks at Soviet perceptions of the energy resource problem and concludes that informed authorities are far more concerned about energy production than official spokesmen publicly or privately suggest. The paper addresses the following questions:

- How serious is the energy problem perceived to be?
- Who makes energy production policy?
- What are the basic motives and features of decisionmaking in the energy production field?
- What alternative strategies have been advocated for meeting the energy problem?
- What choices has the leadership made in recent years and how effectively are present policies being implemented?

The evidence on these questions strongly indicates that the Soviets are not at all sanguine about tapping their energy potential with sufficient speed to avert serious shortages; that a unitary, "rational actor" decision-making model provides a poor basis for understanding what has happened in recent years in energy production policymaking; and that a coherent, long-range strategy continues to be lacking. There are good reasons to suppose that the situation is not likely to improve during the forthcoming Soviet leadership succession. [REDACTED]

The study is divided into five main sections. The first explores the evolution of Soviet perceptions of the energy problem in recent years. The second examines the environment in which energy decisionmakers operate and the impact of this on the process of decisionmaking. A third section provides a summary view of controversy over energy production policy during the past decade. The fourth part analyzes the impact on policy of the December 1977 Plenum of the Central Committee and describes what has happened during 1978. The last section discusses prospects for the future. Details of debate over energy production strategy during the 1970-77 period are presented in the appendix. [REDACTED]

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**Politics of the Soviet
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I. Soviet Perceptions of the Energy Problem

What the Soviets have really thought about the energy problem at any given time is not easily determined.¹ Nevertheless, there has clearly been a growing divergence between the mass propaganda line that energy problems cannot occur in a Soviet-style planned economy and anxiety developing over the situation among even moderately well-informed elements of the population. In Academy of Sciences and intelligentsia circles there has been an awareness of projections in the West of a rapid global exhaustion of conventional energy resources. However, only a handful of individuals have acknowledged—at least implicitly—that even the Soviet Union, with its socialist system of centralized planning and enormous natural resource base, is not immune to the “energy crisis.”²

¹ The difficulty arises in part because the circle of officials who have a comprehensive and accurate appreciation of the overall Soviet energy picture is probably quite small, and these individuals may well keep their opinions to themselves. There is some question as to how much distortion of reality occurs in the statistics furnished to energy decisionmakers. Access to the information necessary to reach an informed judgment appears to be restricted within each production branch, and overview data are probably even more closely held. Many higher Soviet officials and academics with whom Westerners have talked are unlikely to have had access to such data. Moreover, awareness of the extreme political sensitivity of pessimistic energy production information has probably led to deliberate distortion both in public propaganda and “confidential” communications with foreigners. It may be that informed Soviet authorities hesitate to express serious misgivings about the energy situation even among themselves.

² The most prominent public exponent of this view is the famous physicist, Academician Petr Kapitsa, who has used the argument to lobby for more rapid development of nuclear power. Citing *The Limits of Growth* by Dennis Meadows and colleagues, Kapitsa observes that “the inevitability of a global energy crisis is now fully recognized, and therefore the energy problem has become for technology and science problem number one.” (*Vestnik AN SSSR* 1976, No. 1, pp. 34-35.) A well-known coal-processing specialist, Zinovii Chukhanov, has also used the Academy’s journal to argue forcefully, if somewhat indirectly, that a serious energy crisis is inevitable in the USSR unless coal substitution takes place on a large scale. (*Ibid.*, 1976, No. 9, pp. 105-109.)

A majority of informed Soviet specialists have probably dismissed the possibility of a full-blown “energy crisis” on the presumption that vast oil, gas, and coal reserves will be found in Siberia and offshore. The energy problem has been seen fundamentally as a transportation problem. But within this perspective there has been a growing comprehension since at least the early 1970s of the ever-increasing deficit of fuel-energy resources in the European USSR and the dependence of the Soviet economy on massive shipments of energy supplies from Siberia to the west. This awareness has been reinforced by frequent electrical power shortages, breakdowns in natural gas deliveries, and petroleum shortages that have claimed the attention of all the top leaders concerned with energy, from Kosygin down.

Particularly vexing concerns since the early 1970s have been the declining reserves-to-production ratio in the oil industry, water encroachment, and the failure to discover new supergiant oil deposits. The most alarmist noises on this score were voiced by the late Minister of Oil Valentin Shashin, who from the late 1960s until his death in 1977 publicly called attention to the urgent need to discover new oilfields. Shashin’s warnings may have been discounted in some quarters as a self-serving attempt to get lower production targets for the Ministry of Oil. But other people were also making the same point.

Mounting Concern in the 1970s

Overall, there have been signs of a steady increase in top-level concern over the energy problem, although more optimistic assessments have continued to appear. At least a year before the Middle East war and oil embargo of 1973, the evidence indicates that the Soviet leadership was well aware that it had a major problem on its hands. In October 1972, in a speech to the State

Committee for Supply, Kosygin placed unusual emphasis on the need to conserve fuel-energy resources, and at the December 1972 Plenum of the Central Committee a decision was taken to accelerate the development of electric power, oil, and gas in 1973 because of the threat of an energy lag and its potential impact on the entire economy. At about this same time a so-called Big Commission was organized, under the chairmanship of Academician Mikhail Styrikovich, to explore all possible solutions to the energy problem. Subcommissions were established under it to investigate possible courses of action—some quite visionary.³ [REDACTED]

A year later, in late 1973, at the very moment the Soviet press was gloating over the energy discomfiture of the West, the Politburo was engaged in a highly critical review of the situation in the oil, gas, and oil-refining industries, which resulted in a decision to take further steps to improve energy production.⁴ This reassessment was reflected in pronouncements at the December 1973 Plenum of the Central Committee, in extremely pessimistic statements by production officials at a gathering in December 1973,⁵ and again in Deputy Chairman of the Council of Ministers

³ It was proposed, for example, that natural gas be transported out of West Siberia in 5-kilometer-long "trains" of dirigibles, or through floating polyethylene "pipes" anchored to the ground every 30 km. One of the subcommissions, headed by the chairman of the Yakutsk branch of the Academy of Sciences, Nikolay Cherskii, worked up a proposal for the capsule transport of natural gas from Tyumen that was later encouraged by a Council of Ministers resolution in 1974. Another subcommission appears to have been set up under Academician Lev Melent'ev's supervision and with the Institute of High Temperature's participation to evaluate the future role of nuclear power. [REDACTED]

⁴ The Politburo review almost certainly called for an intensified analysis of the energy problem: an unprecedented general assembly of the Academy of Sciences devoted to the energy problem was held in November 1974, and around this time an Institute of Complex Fuel-Energy Problems was established in the State Planning Committee (Gosplan). [REDACTED]

⁵ According to the Minister of Power and Electrification, Petr Neporozhnyi, the European USSR was experiencing a "power hunger," there was insufficient fuel to operate power stations at full capacity, power could not be shifted efficiently from Siberia to the western part of the country, and construction of new power stations was lagging because of a shortfall in capital investments. [REDACTED]

Veniamin Dymshits' sharp criticism of the Oil Ministry at its annual winter meeting in early 1974. Some of this concern was probably provoked by a desire to capitalize more fully upon higher world oil prices, but domestic supply shortages appear to have been an equally important factor. The seriousness with which the energy problem was being treated at the time, however, was deliberately masked in the dealings of Soviet leaders with outsiders. [REDACTED]

In 1975-76 there were more discussions of the energy problem, more signs of concern, and more decisions—all focusing on the 10th Five-Year Plan (1976-80). At the 25th Party Congress in March 1976, which confirmed a preliminary outline of the 10th Five-Year Plan, Kosygin indicated his uncertainty concerning the "reliability" of energy supplies and called for more rapid development of fuel reserves in order to guarantee against "lack of energy" some time "in the future." The 10th Five-Year Plan itself was not finally approved until October 1976, and this delay has been attributed by some to a failure to resolve energy issues. At the October 1976 Plenum of the Central Committee, which confirmed the plan, Brezhnev declared that energy demands were outstripping resources and that, consequently, it was necessary to set supplementary targets for oil, gas, and coal production and to "introduce rigid coefficients of [fuel] expenditure." Shortly after the Plenum, a joint Central Committee - Council of Ministers resolution was issued that called for more rapid preparation of oil, natural gas, and gas condensate reserves in West Siberia. [REDACTED]

Thenceforth, throughout 1977, there were consistent indications of high-level anxiety over energy supplies. At the meeting of a Ministry of Oil Collegium in early 1977, Dymshits revealed that nonfulfillment of the supplementary plan for 1976 had "created certain difficulties in supplying the economy with fuel" and called for a crash pipeline program. Within Gosplan, the Soviets explored the question of increasing somewhat the small quantities of oil already being purchased abroad. Both Gosplan Chairman Nikolay Baybakov and Kosygin indicated a pressing interest in moving rapidly into offshore oil exploration and development. President of the Academy of Sciences Anatoliy Aleksandrov referred in June to the seriousness of the oil situation and the difficulty of resolving

disputes over the proper strategy to pursue. "At the present time," he declared, "our energy production is in a very complex stage of development." Over the longer run, without a shift to coal, he foresaw that the Soviet economy would "encounter great difficulties."⁶ And in November, "fundamental shortcomings" in the fuel energy sector were castigated at a Supreme Soviet planning-budgetary commission meeting. [REDACTED]

To say that individual Soviet leaders are aware that a serious energy supply problem exists is not to say, however, that the decisionmaking process in which they are collectively caught up has been able to respond effectively to the perception of danger. [REDACTED]

II. Soviet Energy Decisionmaking

The Environment of Energy Decisionmaking

Soviet energy officials work in a special environment and are compelled to respond to the cues this environment provides, even when the resulting behavior is irrational from the standpoint of the regime's professed objectives, of our own projections of what "they ought to do," or of the officials' own common sense. In this respect the situation in energy is no different from that in other areas of the economy, despite the high priority of energy. The cues are a product of deep-seated structural features of the Soviet economic and political system that have proved highly resistant to change. Among the relevant economic factors are:

- The overwhelming pressure to meet this year's plan or satisfy current needs at the expense—if need be—of longer term interests. Meeting short-term demands is what determines an official's reputation, job prospects, and material well-being.
- The secondary significance of genuine cost-efficiency as a criterion of individual or organizational success.

⁶ Aleksandrov's comments were printed in *Vestnik AN SSSR* 1977, No. 6, pp. 14-15.

- The chronic overcommitment of resources, lack of balance between planned inputs and projected outputs, and certainty of shortages.
- The unreliable quality of intermediate goods.
- The unreliability of economic statistics.
- The risks of major technological innovation. Technological innovation means new, untested dependencies, new unreliable supplies, new personnel patterns, and almost certain delay. Running these risks is not rewarded.
- The pervasive rule-breaking and illegality required to fulfill economic plans.
- The severe shortage of highly valued goods: satisfactory housing, quality food and clothing, automobiles, and the opportunity for foreign travel.

To these features of the economic environment must be added a number of political factors that are simply part of the landscape for Soviet officials:

- The absence of desirable or calculable career options outside the bureaucratic track. Although some officials find a safe haven in the Academy of Sciences, for most there is only one game to play—the one they are already in within a given organizational milieu.
- Vulnerability to "political" charges. Despite the very real "erosion of ideology" that has occurred in Soviet society, officials must anticipate and hedge against the possibility of being victimized by political "label sticking."
- Vulnerability of all officials to instant removal from their jobs outside of normal channels through the party-dominated system of personnel control. There

⁷ In the energy area some sins to be avoided include jeopardizing Soviet independence in the international arena through indebtedness or technological dependence; selling out the natural resource patrimony of the country; kowtowing to foreign technology and "underestimating" the quality of domestic efforts; failing to recognize that the Soviet system of centralized economic planning protects it from the "energy crisis" of Western capitalism; or underestimating the imperialist danger and encroaching upon the resources and investment needs of the defense sector of the economy. [REDACTED]

has been far less of this intervention since 1964 than there was under Khrushchev, but it remains a source of anxiety.

- The omnipresence of informal sponsorship, protection and patron-client relationships. [REDACTED]

In combination, these two sets of factors evoke certain characteristic behavior patterns that strongly influence energy decisionmaking. The positions Soviet decisionmakers take on issues tend to be responses to immediate role pressures, rather than responses motivated by "statesmanlike" concerns—ideological, patriotic, or otherwise, although these concerns do indeed exist. Because of the constraints imposed on acknowledging short-run "departmental" or personal "careerist" aims, a constant masking or rationalization of vested interests takes place in policymaking and execution. [REDACTED]

Soviet policymakers address immediate demands and seek solutions that will work in the near future; they are compelled to adopt a shortrun point of view. As Party Secretary Vladimir Dolgikh put it, "I have to have a piece of black bread today, right away. I can't think about what's going to happen tomorrow." At the same time there is a strong tendency, in the Soviet jargon, to "reensure." While top Soviet officials will vigorously push their own departmental interests, in general they seek to avoid controversial policy stands that could lead to their isolation from other officials. By and large this sensitivity to which way the wind is blowing has been a crucial element in the career success of these officials. The broader the responsibilities of a leader, the more cautious and consensus-oriented his behavior is likely to be. A premium is placed upon forging favorable or at least benign relations with other institutional power centers, sometimes through means that verge upon corruption.⁸ Simultaneously, production officials attempt to reduce the dependence of their own units on other organizations by pursuing autarkic measures in such fields as

⁸ A good example, which also illustrates the way informal influence can distort the structure of operational command, is found in the relation between Gosplan energy departments and the ministries. The ministries, which have a larger quota of foreign exchange allocated for trips abroad than their putative planning superior, offer placement on delegations abroad to promote more accommodating relations with those Gosplan officials whose decisions on plan targets and supplies are critical for the ministries' own success. [REDACTED]

construction and transportation. On the personal level there is a deliberate and intense cultivation of connections with subordinates, peers, and superiors, both for self-promotion and as a guarantee against adversity. [REDACTED]

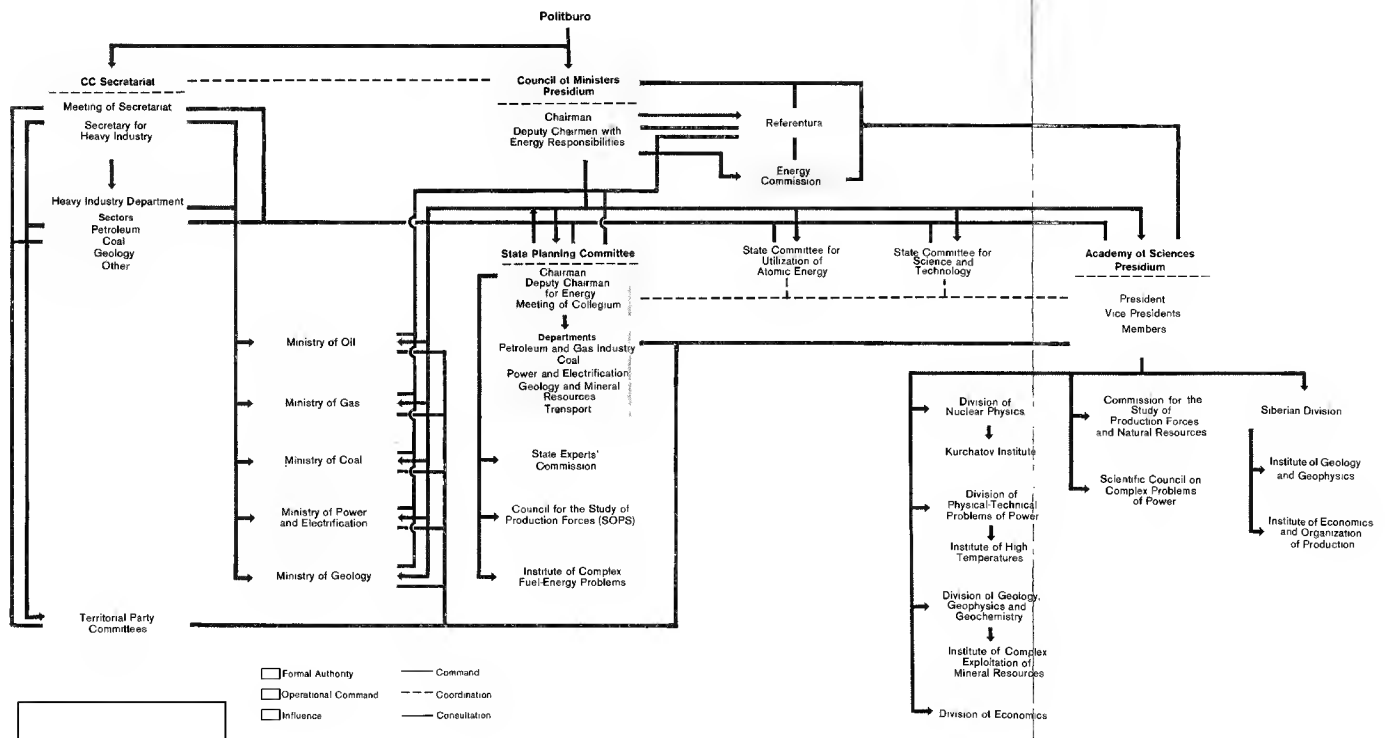
The Structure of Power in Energy Decisionmaking

In analyzing Soviet energy decisionmaking it is useful to distinguish among three types of power: formal authority, operational command, and influence. Each of these is based on certain resources, and each is significant in its own way. The institutional reflection of this pattern of power is shown in the accompanying foldout chart. Formal authority attaches, above all, to the party Politburo—the highest policymaking body in the Soviet system of rule. Operational command is associated with the Central Committee Secretariat and departments, the Presidium of the Council of Ministers, Gosplan, and to some extent the various ministries involved in energy production. Influence is wielded by the Referentura of the Council of Ministers (a subunit within the Council of Ministers' Administration of Affairs), a number of ministries, the State Experts' Commission and institutes of Gosplan, the State Committee for Science and Technology, the State Committee for Utilization of Atomic Energy, certain branches of the Academy of Sciences, and regional authorities. [REDACTED]

As elaborated below, there is a major disjunction between the structure of formal authority and the structures of operational command and influence. Some interlocking of operational command and influence takes place by virtue of the roles performed by key figures like Chairman of the Council of Ministers Kosygin, Gosplan Chairman Baybakov, and—to a lesser extent—Central Committee Secretary Dolgikh, who is responsible for heavy industry. The net effect is probably to place the center of gravity of energy production decisionmaking in the Presidium of the Council of Ministers – Gosplan sphere. However, power in energy decisionmaking remains diffused among leaders and institutions: there is no point at which all the strands come together. [REDACTED]

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Soviet Energy Production Decisionmaking



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Formal Authority

The Politburo. The Politburo's authority gives it a potentially decisive voice in energy affairs. It has the ultimate right to approve or disapprove policy proposals set before it; it has the right to demand accountability and information from all officials; and it has the final say on the promotion, tenure, and demotion of top leaders, including those who belong to the Politburo itself. To some extent it does bring these resources to bear on energy matters. It confirms the basic energy policy lines that are expressed in annual and five-year economic plans, determining in this manner the share of resources to be allocated to energy development. It probably serves as a forum for occasional top-level discussions of key energy projects. And it may become involved in settling serious interorganizational disputes. [REDACTED]

There are, however, real limitations on the effective power of the Politburo in energy matters. It is a committee made up of persons whose occupational responsibilities and organizational base of operations generally lie elsewhere. It divides its attention among a multitude of questions, many of which have had far greater immediacy than energy. It is not known to have any special subgrouping for energy affairs—in contrast, for example, with its arrangements for handling military-security affairs. Basically it lacks expertise in energy issues. While a number of members have had peripheral contact with energy questions as regional bosses, only Kosygin among the full members and, to a lesser extent, RSFSR Premier Solomentsev and First Deputy Chairman of the Council of Ministers Nikolay Tikhonov among the candidate members, have had prolonged experience in supervising energy affairs. Thus the Politburo is largely dependent upon external sources of information and advice; as an institution it cannot be considered a source of energy policy initiative. Probably it deals with energy issues only episodically. At best, it chooses from among competing policy options. [REDACTED]

Operational Command

The Secretariat. Operational command in energy, as in other matters, is shared between the Central Committee apparatus and the Council of Ministers. In principle the Central Committee apparatus spearheads

policy review, verifies the fulfillment of policy decisions already adopted, and oversees personnel appointments. But the available evidence, which is far from adequate, suggests it is unlikely that the Central Committee apparatus has participated very actively in the search for basic solutions to Soviet energy problems. Most of its time is probably devoted to monitoring and intervening in current production activities. [REDACTED]

There is no evidence that Brezhnev, as General Secretary, has assumed the same kind of sustained operational control in the energy field that he has in military and security affairs, foreign policy, or agriculture.⁹ In recent years Andrey Kirilenko has been the only Central Committee secretary directly responsible for industrial matters who has simultaneously been a member of the Politburo. While it is known that in the past he has participated occasionally in decisions related to energy production, there is no evidence that he has been involved on a regular basis in energy production policymaking in recent years. Kirilenko's main connection with energy problems appears to be in the field of fuel conservation, in which he is currently playing a visibly active role. [REDACTED]

Only two other Central Committee secretaries deal with industrial affairs: Yakov Ryabov, who handles defense industry, and Vladimir Dolgikh, the secretary responsible for heavy industry. Dolgikh, who also heads the Central Committee's Heavy Industry Department and personally supervises those sectors within it that deal with energy questions, is clearly the

⁹ He did obviously take the lead in December 1977 in changing the policy line on the energy balance approved in March 1976 by the 25th Party Congress, and in the subsequent campaign to promote faster oil and gas development in Tyumen Oblast. And he has been known on occasion to have issued direct orders connected with energy matters. But over the years he has probably addressed himself to energy problems largely within the context of broader issues: discussion of annual and five-year plans, the general question of efficiency of the economy, the development of regional production "complexes," and Soviet relations with Eastern Europe and the capitalist West. [REDACTED]

Key Soviet Energy Decisionmakers



Aleksey Kosygin



Vladimir Dolgikh



Vladimir Novikov



Nikolay Baybakov



Veniamin Dymshits



Vladimir Kirillin

official in the Secretariat primarily responsible for energy production.¹⁰ [redacted]

Dolgikh's role and that of the sectors for geology, coal, and petroleum in the Heavy Industry Department are among the least publicized in the entire area of energy administration, and our knowledge of them is based on fragmentary information. As the Secretariat's energy controller, Dolgikh has potentially been in a strong position to influence energy production policy and implementation. He is the highest party leader dealing routinely with officials in the Council of Ministers responsible for energy matters. [redacted]

[redacted] Appeals related to energy development directed to the Central Committee over the years by provincial party and economic leaders as well as by central government officials have raised both policy and implementation issues. These appeals suggest that the power to issue orders to Gosplan and individual ministers, if not to the Presidium of the Council of Ministers and Kosygin personally, lies with the Secretariat and the Central Committee departments, although how actively this power has been exercised is moot. It is probable that significant policy innovations originating in the Council of Ministers or below it are routinely coordinated with the Central Committee apparatus before being brought up for final decision at meetings of the Presidium of the Council of Ministers.¹¹ [redacted]

¹⁰ Dolgikh is a metallurgical mining engineer by training and served most of his career in Krasnoyarsk Kray of central Siberia. He probably owes his rapid promotion to the Central Committee Secretariat, in 1972, to the sponsorship of Kirilenko and perhaps of Brezhnev as well. Within the Secretariat his jurisdiction, in addition to the energy area (oil, gas, coal, and electric power), has included geological exploration, nonfuel extractive industries, ferrous and nonferrous metallurgy, the chemical industry, some branches of machine building, construction, and transportation. [redacted]

¹¹ Traditionally, it has been the practice to call upon individual republic and oblast party committees to give a formal accounting of their activities before the Secretariat, and these accounts are preceded by an investigation conducted by Central Committee apparatus personnel. When the regions selected have been major bases of fuel production, the lengthy resolution that customarily caps the entire process in effect sets a party "line" that must be taken into account by Gosplan and the branch ministries in decisions related to operations in a given region. [redacted]

Unquestionably, there have been good reasons for officials in the Council of Ministers to check first with Dolgikh and the Central Committee Heavy Industry Department, to seek support from them, and to heed their "suggestions."¹² Yet the available evidence does not indicate that Dolgikh has played as active a role in energy production policy as one might suppose. He has not made major public speeches on energy issues or published articles devoted specifically to this field. [redacted]

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It must be emphasized, of course, that the evidence here is thin and largely negative in nature. Still, there are plausible reasons for Dolgikh and his subordinates to have exercised less influence over energy affairs than has been true of Secretariat involvement in such fields as agriculture or ideological affairs. [redacted]

Lacking even candidate membership in the Politburo, Dolgikh's personal political status is far lower than that of Kosygin—the ultimate authority on energy in the Council of Ministers. Moreover, Dolgikh's span of control has been so broad that he has probably been able to devote only a fraction of his time to energy matters. His professional experience in the nickel industry, while having some bearing on fuel extraction, could hardly have given him an edge in discussions with Kosygin, who has been dealing with energy issues for at least two decades, or with Gosplan Chairman Baybakov, who spent most of his career in the oil industry, or with any of the energy branch ministers, or with specialists in the Academy of Sciences. Nor is it clear that Dolgikh has *wanted* to exert great influence on energy policy. [redacted]

¹² Dolgikh has had the ear of Brezhnev and Kirilenko, and has the responsibility of making policy recommendations to the Secretariat, and through the Secretariat to the Politburo itself. He has certainly been in a strong position to obstruct actions proposed within the Council of Ministers. And he also has probably had a major voice in making top personnel decisions at the ministry level—a matter of fundamental concern to leaders in the Council of Ministers. [redacted]

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X1 [] Finally, doubts may be entertained about the quality of advice Dolgikh may have been getting on energy policy from key subordinates in the Heavy Industry Department.¹³ []

X1 **Presidium of the Council of Ministers.** The scene of greatest operational activity in energy production decisionmaking appears to be the Presidium of the Council of Ministers, the "cabinet" of the Soviet governmental apparatus. The Presidium consists of the chairman, the first deputy, and deputy chairmen, and—it seems—all other members of the Council of Ministers at large who enjoy full membership in the Central Committee of the CPSU. Within the Presidium there is a relatively stable division of labor, although roles overlap and depend to some extent on the play of personal connections and ambitions. []

X1 **Kosygin's Role.** Kosygin has been the top Soviet leader most deeply involved in energy production matters. He has dealt with energy issues frequently since at least the late 1950s and is without question the best-informed Politburo member on the subject. Within the Presidium of the Council of Ministers, Kosygin has taken the lead in pressing the search for long-term solutions to the Soviet energy problem. He has made repeated investigatory trips to energy-producing regions and has convened meetings in Moscow to discuss energy affairs. He supervises the deputy chairmen responsible for day-to-day control of energy production, but has the authority to intervene directly and issue orders to production ministries and Gosplan. It is also within his power to approve recommendations of the Energy Commission for direct implementation. At various times Kosygin has adjudicated interdepartment conflicts over energy production. He probably has a dominant voice in deciding which energy proposals will be placed on the agenda of Presidium

X1 ¹³ On paper, at least, the credentials of these officials as energy advisers are not overly impressive. The deputy head who attended the January 1977 meeting of the Oil Ministry Collegium, Vladimir Arkhipov, had only recently been promoted from the backwater post of chairman of the Coal Workers' Union. His fellow deputy head, Ivan Yastrebov, who represented the Department on the same occasion in 1978, lacks any professional background in energy whatever. He is a prototypical party worker who has been employed in the party bureaucracy for over 30 years. His only qualification would appear to be a longstanding association with the Department's first deputy chief, Sergey Baskakov, who also is short on training or professional experience in the energy field. []

meetings, and he firmly presides over these meetings and sums up the results. He has special responsibilities in the foreign field, where he is probably the Politburo's top supervisor of energy-related trade negotiations. The combined weight of these various roles probably enables Kosygin to dominate the official interactions on energy matters of the Presidium with the Central Committee Secretariat and Politburo and to prevent policy recommendations that he opposes going forward from the Presidium. []

The Deputy Chairmen. In one way or another most of the deputy chairmen of the Council of Ministers deal with energy matters, but some are more directly involved with production than others. It appears that First Deputy Chairman Nikolay Tikhonov, for example, has dealt with power plant affairs and aspects of the metallurgical industry related to energy, and his jurisdiction may expand as a result of his promotion to candidate member of the Politburo in November 1978. Deputy Chairman Ignatii Novikov, like Tikhonov an old client of Brezhnev from Dnepropetrovsk, has broad supervisory responsibilities in the construction of energy-related production facilities and infrastructure. Deputy Chairman Vladimir Kirillin, chairman of the State Committee for Science and Technology, is a key figure in Soviet energy research and development (R&D). And Deputy Chairman Baybakov is a central actor in his capacity as chairman of Gosplan (described below). But the Politburo—presumably with Kosygin's concurrence—has assigned basic responsibilities for energy production to two other deputy chairmen—Vladimir Novikov and Dymshits. []

There appears to be a stable, two-tiered structure of authority going back at least to the 1960s in which responsibility for overseeing the entire Soviet energy sector (fossil fuel extraction and electric power generation) has been assigned to one deputy chairman, Vladimir Novikov, while specific responsibility for supervision of oil, gas, and coal production has been assigned to a "deputy chairman for fuel-energy affairs"—M. T. Efremov until 1972, and then Dymshits. In this overlapping arrangement, Novikov has clearly been the senior figure, although formally he does not outrank Dymshits and both report to Kosygin. Novikov, a military production specialist and longtime

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associate of Defense Minister Dmitri Ustinov, has been one of the Soviet Union's top foreign economic relations administrators and was briefly chairman of Gosplan. [REDACTED]

Both Novikov and Dymshits have a small secretariat and several assistants, but no separate research or policy planning capability. For these functions they rely upon the Referentura of the Presidium of the Council of Ministers, the production ministries and their institutes, Gosplan, and any outside sources (Academy of Sciences or other) they wish to utilize. Both can issue orders to ministers and can bring proposals to Kosygin or meetings of the Presidium. They are probably the normal channel for communication between the energy-producing ministries and the chairman. One of them—it is unclear which—chairs the Energy Commission of the Presidium. The basic tasks that they are called upon to perform are policy planning, coordination of energy production with other sectors of the economy, adjudication of conflicts among energy-producing branches, supervision of implementation of energy production plans, and promotion of Soviet international energy policy objectives. While Dymshits' predecessor, the former party official Efremov, participated in policy debates, it appears that Dymshits has tended to avoid policy stands and to stick to administration. His circumspection may be explained partly by his vulnerability as the most prominent Jewish leader in the Soviet hierarchy and partly by the fact that until 1976 he held the taxing post of chairman of the State Committee for Supply, where, in effect, he was the chief "wholesaler" for the entire Soviet economy.¹⁴ Like Dymshits, Novikov has been burdened with a number of other tasks that must have permitted him to devote no more than a small fraction of his time to energy affairs.¹⁵ [REDACTED]

¹⁴ As a deputy chairman it is quite possible that he may still retain some supervisory responsibilities in the supply area and may also have been assigned other tasks since 1976. [REDACTED]

¹⁵ Novikov has special responsibility for the Soviet machine-building sector, and has also been chairman of the Presidium's Commission for Foreign Economic Questions. The range of his concerns apart from energy is suggested by the obituaries he has signed of officials in the fields of construction, foreign trade, light industry, the automobile industry, rocket and space technology, banking, finance, and state statistics. [REDACTED]

The Energy Commission. The Energy Commission is one of a number of permanent functional commissions attached to the Presidium of the Council of Ministers.¹⁶ Its membership is said to include the two deputy chairmen responsible for energy matters, the branch ministers for energy production (Oil, Gas, Coal, Construction of Petroleum and Gas Industry Enterprises, Power and Electrification), some of their deputies, the chairman of Gosplan (Baybakov) and his deputy for energy affairs (Arkadiy Lalayants), the Minister of Finance, and at least one outside expert—Academician Mikhail Styrikovich. There may well be other members. [REDACTED]

Whether Dymshits succeeded Efremov as chairman of the Commission when he took over the latter's duties as deputy chairman for fuel-energy affairs on an acting basis in 1972 is unknown. The Commission has no staff of its own but depends on the Council of Ministers' Administration of Affairs for logistic support. The Commission, which is said to meet weekly, discusses the production targets generated by Gosplan and may give them its stamp of approval. In the area of policy it discusses longer term energy development schemes and assigns project work to the relevant ministries and institutes. At the same time it provides a forum for the preliminary discussion of energy policy proposals and makes general recommendations to the full Presidium of the Council of Ministers. It is likely that the Energy Commission provides an arena for intensive jockeying for resources among the energy production ministries and for negotiation between the ministries and Gosplan. Decisions that it takes probably tend to accommodate the vested interests of all the participating ministries, and may well be difficult for outside bodies subsequently to challenge. [REDACTED]

The Presidium. The Presidium of the Council of Ministers reportedly meets every other Wednesday to discuss, amend, approve, or reject draft resolutions that have been prepared elsewhere. Its meetings are attended by members, officials from the Referentura,

¹⁶ The most important, and almost certainly the most organizationally developed commission, is the Military-Industrial Commission. Other commissions are known to exist for foreign economic questions, CEMA affairs, supply, major industrial construction, and agriculture. There is also a Presidium Commission for Operational Questions, which, Kosygin stated in July 1978, "is called upon to examine and solve current questions of economic building and to implement systematic control over fulfillment of the state plan and budget." [REDACTED]

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X1 and officials or specialists called to testify on individual proposals. Kosygin chairs the meetings, and decisions appear to be taken on a consensual basis, as registered by Kosygin, without formal voting.¹⁷ [redacted]

X1 Although the draft resolutions are the product of extensive coordination and negotiation among interested organizations, including Central Committee departments if the matters dealt with are important, the discussion of them at Presidium meetings is not necessarily pro forma. At the Presidium meeting, aspects of a problem may be discussed that have not been raised before, or at least not raised in Kosygin's presence. Dissenting opinions can be and are expressed. Claims for additional resources can be registered where decisions lay additional burdens on organizations. And, finally, confirmation of proposals provides an authoritative decision that must then be carried out. [redacted]

X1 **Gosplan.** A critical function in energy production decisionmaking is performed by Gosplan and its chairman, Baybakov. In Gosplan the focal points of activity related to energy production are the chairman himself, the deputy chairman for energy affairs (Lalayants), the branch departments (Coal, Geology and Mineral Resources, Petroleum and Gas Industry, Power and Electrification, Transport), and the Collegium.¹⁸ [redacted]



Arkadiy Lalayants
Gosplan Deputy Chairman for Energy Affairs [redacted]

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Baybakov's role has been central to the performance of Gosplan. His power stems from both the office of chairman and his own personal prestige. He is a deputy chairman of the Council of Ministers and—like the Minister of Finance—an ex officio member of all the Presidium commissions, including the Energy Commission. He has direct access to all the top Soviet leaders. It is within his competence to initiate studies and consider analyses of the entire range of energy questions, acting either through Gosplan or jointly with branch ministries and the Academy of Sciences—and he has exercised this authority. As the chief Soviet planning official, he presides over the preparation of plans for the energy sector and is strategically situated

X1 ¹⁸ Within Gosplan, Deputy Chairman Lalayants is responsible for energy, transportation, and the chemical industry. He supervises the Gosplan departments in these fields and deals with the appropriate branch ministers. He has a small staff of 5 to 10 people, but relies for information primarily on the departments under his jurisdiction and the State Experts' Commission. The role of the departments appears to be mostly technical: drafting plans, arranging changes in plans midstream, and monitoring plan fulfillment. But some department chiefs, such as the current head of the Petroleum and Gas Industry Department, Vladimir Filanovskiy, seem to play a more active role in policy formation. The Gosplan Collegium consists of the chairman and deputy chairmen, some department heads, officials from Gosplan's own consultative and research bodies, and chairmen of republic planning commissions. It is dominated by Baybakov and provides a forum for policy review and the discussion of innovations in production and management of the economy. [redacted]

to frame energy options that are set before the Presidium of the Council of Ministers and the Politburo itself. His considerable personal influence derives from the good relations he has had with leading Soviet politicians and his extensive network of clients within and outside Gosplan, as well as from the respect he enjoys as an informed expert. He has spent most of his career in the oil industry and is probably regarded in leadership circles as one of the most authoritative voices on oil issues, with which he has dealt most of his career. [redacted]

Influential Advisers

Information, broadly defined, is especially critical in the energy field. Top policymakers are so busy that they may well not even *have* positions on energy policy issues; and they are not likely to have digested the technical knowledge necessary to evaluate the merits of various positions. The experts who possess or control information in the energy sphere can, therefore, exert considerable influence on policy. [redacted]

At the national level a complex information-generating apparatus complements the structure of operational command. Its main components are the Referentura of the Council of Ministers; the State Experts' Commission, Council for the Study of Production Forces, and Institute of Complex Fuel-Energy Problems of Gosplan; the production branch ministries and their institutes and advisory councils; the State Committee for Science and Technology; and the Academy of Sciences. [redacted]

The Referentura. The Referentura of the Council of Ministers is the consultative-advisory staff that serves the chairman and deputy chairmen of the Council of Ministers. It consists of approximately 300 persons, about evenly divided between clerical workers and high-level, full-time advisers known as *referents*. The *referents*, in turn, recruit outside consultants who are paid on a per-job basis to conduct research, write memorandums, and draft various documents.¹⁹ [redacted]

¹⁹ Among the *referents* there are hierarchical gradations based on whether a *referent* is directly subordinate to Kosygin or simply subordinate to one of the deputy chairmen, whether the *referent* is responsible for an entire sector of the economy or just for a particular ministry, and whether the *referent* is head of a department within the Referentura. [redacted]

Ivan Popyrin, head of the Department for Problems of Fuel Energy, Foreign Trade Ties and Domestic Fuel-Energy Supply, is the key *referent* for energy questions in the Referentura.²⁰ He has worked for both Kosygin and Novikov and has dealt with Dymshits as well.

[redacted] Popyrin is in almost daily contact with Kosygin. His job is to consider the basic policy choices in energy affairs, investigate solutions to production, transportation and trade problems, and advise Kosygin and Novikov accordingly. While he, like other *referents*, is not vested with the authority to issue commands, he is feared by economic managers because of his independence and access to the top leadership in the Council of Ministers. He distrusts information supplied by the ministries and their institutes and prefers to rely on consultants he himself has chosen, whose memorandums he forwards directly to Koysgin.²¹ [redacted]

State Experts' Commission. In Gosplan, a body analogous to the Referentura exists in the form of the State Experts' Commission. This commission also employs part-time consultants, who in fact carry out most of its analytic work. The Commission has no true authority, but is responsible for advising Baybakov on any topic in which he is interested. The Commission official primarily concerned with energy matters is its deputy chairman, Yuriy Bokserman, a castoff former Deputy Minister of Gas, who owes his prominent job and "Kremlin ration" exclusively to Baybakov's protection. [redacted]

²⁰ Other *referents* are responsible for the separate production ministries. [redacted]



Nikolay Nekrasov
Council for the Study of Productive Forces (Gosplan)

For information, Baybakov has also drawn on the Council for the Study of Productive Forces (SOPS), headed by Nikolay Nekrasov, and the recently established Institute of Complex Fuel-Energy Problems, headed by Sergey Yatrov—both of which fall under Gosplan control. SOPS specializes in the analysis of broad regional planning problems, and Nekrasov has concentrated much of his attention on Siberian development.

At a lower level in the government hierarchy each ministry has its own network of research and design institutes and advisory councils. While a competition of ideas can and does take place in these forums, their pronouncements to the external world—especially when articulated in Moscow—are closely vetted so as to reflect ministerial interests.

State Committee for Science and Technology. The State Committee for Science and Technology has the potential for great influence over energy policy, which in practice it may not have fully realized. Its chairman, Vladimir Kirillin, who is also the deputy chairman of

the Council of Ministers responsible for science policy, was head of the Department for Science, Schools, and Higher Education in the Central Committee from 1955 to 1962 and then a vice president of the Academy of Sciences until 1965. His career—and contacts—bridges the Academy of Sciences—Communist Party—government domains. His field of professional specialization is power engineering, and at his initiative the Institute of High Temperatures of the Academy of Sciences, which is responsible, among other things, for the Soviet program in magnetohydrodynamic (MHD) direct conversion of thermal into electrical energy, was established in 1963.²²

The main task of the Committee is to elaborate plans for Soviet scientific and technological development, which are then confirmed by the Central Committee apparatus and the Presidium of the Council of Ministers. In generating these plans the Committee works closely with the Academy of Sciences, the ministries, and Gosplan. Its prime source of influence lies in its authority—acting in concert with Gosplan and the Ministry of Finance—to pass judgment on the R&D proposals of the Academy of Sciences and branch institutes and to allocate the Soviet science budget. The Committee also closely monitors progress on a limited number of high-priority projects, some of them in the energy field. It has numerous subcommittees and councils, including the Council on the Problem of Power and Electrification and the Subcommittee on Renewable Sources of Energy, which are important mechanisms of R&D coordination.

²² One of his three first deputy chairmen, Dmitriy Zhimerin, was Minister of Electric Power Stations under Stalin, later served as a deputy chairman of the RSFSR and USSR Gosplans, and from 1964 to 1971 directed the leading institute of the Ministry of Power and Electrification—the Krzhizhanovskiy Power Engineering Institute in Moscow. He has been active professionally in the fields of MHD development and research on superconductive electric powerlines. Another of his deputies, Genadiy Aleksenko, has also specialized in power generation and transmission as well as communications equipment and transportation. He is responsible for mineral resources, power and electrical engineering, and transportation. Still another deputy, Kosygin's son-in-law, Dzherman Gvishiani, is responsible for the international activities of the Committee and is also director of the Committee's Institute of Systems Research in Moscow, which conducts some energy-related research. Gvishiani has been a prominent exponent of Soviet acquisition of Western energy technology and has been active in energy trade and scientific exchange negotiations.

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**Key Academy of Sciences
Energy Advisers**



*Anatoliy Aleksandrov
President of the USSR Academy of Sciences*



*Mikhail Styrikovich
Chairman, Division of Physico-Technical
Problems of Power*



*Nikolay Mel'nikov
Chairman, Commission for the Study
of Production Forces and Natural Resources*



*Lev Melent'ev
Chairman, Scientific Council
for Complex Problems of Power*



*Andrey Trofimuk
First Deputy Chairman, Siberian Division*

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Academy of Sciences. Within the Academy of Sciences, responsibility for energy studies is spread among a number of individuals and groups. In the Presidium of the Academy, the President, Anatoliy Aleksandrov (who is also the director of the Kurchatov Institute of Atomic Energy), chairs a permanent commission that supervises the elaboration of a long-term program for the USSR's fuel-energy complex. He is himself a forceful advocate of nuclear power, although evidently not of fusion energy. The new first vice president for science and technology, Yevgeny Velikhov, is also deputy director of the Kurchatov Institute. Aleksandr Sidorenko, the vice president for earth sciences, was Minister of Geology until 1975. And Vice President Guriy Marchuk, chief of the Siberian Division of the Academy, has overall responsibility for a considerable amount of Siberian energy-oriented research. The remaining membership of the Presidium includes a number of research administrators or scientists with energy-related interests: Nikolay Inozemtsev (foreign technology acquisition); Petr Kapitsa (nuclear power); Nikolay Mel'nikov (natural resources planning); Boris Paton (welding technology); Mikhail Styrikovich (MHD and general energy studies); and Andrey Trofimuk (Siberian geology). [redacted]

Serious research that bears directly upon energy production policymaking is concentrated in several centers of the Academy. The most important of these is the Division of Physico-Technical Problems of Power, headed by Academician-Secretary Styrikovich. Styrikovich, who also directs a laboratory at the Division's Institute of High Temperatures and until 1976 was chairman of the Division's Scientific Council on Complex Problems of Power, is one of a handful of top-level Academy spokesmen on energy policy issues. The Division has broad responsibilities for managing energy research, which it coordinates with other divisions of the Academy and with the State Commit-

tee for Science and Technology.²³ Its Scientific Council for Complex Problems of Power was organized in 1965 for the purpose of "determining the basic scientific directions and most effective proportions and paths of development of electrification, power engineering, and the fuel industry as a single branch of material production, and also of coordinating theoretical research in these areas." [redacted]

The chairmanship of the Council was shifted in 1976 from Styrikovich to the former deputy chairman, Lev Melent'ev. Melent'ev, a specialist in thermal power stations, is deputy academic secretary of the Division of Physico-Technical Problems of Power and until 1974 was concurrently director of the Siberian Power Institute. Since then he has spent all his time in Moscow, where he has headed a department concerned with energy-related economic studies in the Institute of High Temperatures and has also served as Styrikovich's deputy in the Division. Professionally, he has collaborated in recent years with Kirillin, Styrikovich, and A. Ye. Sheyndlin (Director of the Institute of High Temperatures) on MHD research. [redacted]

The second main center of energy-related studies in the Academy of Sciences is the Commission for the Study of Production Forces and Natural Resources, chaired by Nikolay Mel'nikov, which is organized under the Academy's Presidium. Mel'nikov is a specialist in open-pit coal mining with extensive leadership experience in the coal industry. Recently he was appointed director of the Institute of Complex Exploitation of Mineral Resources in the Division of Geology, Geophysics, and Geochemistry. Over the years he appears to have forged strong links with Gosplan, where he has served in a top-level advisory capacity. The Commission has focused its attention on long-term forecasting

²³ According to a recent statement by Styrikovich, institutes and scientists within the Division are working on the long-term fuel-energy program under the guidance of Aleksandrov's commission. They are studying energy applications of electrophysics and electrotechnology; long-distance energy transmission; determination of the best size of equipment for fossil and nuclear as well as hydroaccumulating power stations; optimization of the country's fuel-energy balance for the next 15 years; optimization of the development strategy and use of nuclear power, including fast breeder reactors; energy applications of superconductivity; creation of super-powerful turbogenerators; MHD generation of power; heat-exchange devices; and a number of other subjects. The Division is also heavily involved in foreign scientific exchanges. (*Vestnik AN SSSR* 1977, No. 7, pp. 81-84.) [redacted]

of the use of natural resources, including energy production and consumption, with special emphasis on the formation of regional production complexes. With the Commission as his organizational base, Mel'nikov has emerged as perhaps the most prominent energy balance expert in the Academy, or at least one of the top three along with Styrikovich and Melent'ev. []

Other centers of energy study in the Academy include the Permanent Commission for Scientific Problems of Development of Transport, the Division of Economics, and the Siberian Division in Novosibirsk. In the Siberian Division the key leaders have been Andrey Trofimuk, the first deputy chairman of the Presidium of the Division and director of its Institute of Geology and Geophysics, and Abel Aganbegyan, Director of the Institute of Economics and Organization of Industrial Production. Trofimuk has spearheaded Siberian oil and gas development, and Aganbegyan has encouraged mathematical modeling of the Soviet energy balance as well as regional economic analysis of West Siberia and other Siberian fuel-producing areas. []

The Process of Energy Decisionmaking

The capacity of the Soviet leadership to deal with the energy problem is significantly constrained by the environment and institutions outlined above. Certain features of the process of decisionmaking that emerge in this context are important:

- There is no single center of control over energy production policy. Pieces of control are lodged at various places in the Presidium of the Council of Ministers, the ministries, the Secretariat, and the Politburo. No top official devotes all his time to energy questions. While Brezhnev, Dolgikh, and the Central Committee apparatus can and have intervened in energy production policy, it does not appear that the party bureaucracy exercises tight, effective control over this area, nor does it seem that Kosygin has it all his own way either.

- Policy ordinarily emerges through a labyrinth of bureaucratic negotiation, although "breakthroughs" can occur. Negotiation takes place by means of

personal contacts and exchanges of opinion among top leaders. Formal interorganizational coordination processes, which magnify the influence of "veto" groups, also put a premium on negotiation.²⁴ And negotiation is built into the system of "collective" sounding boards that exist at all levels of the decisionmaking process: the institute collegiums, regional party bureaus, ministry collegiums, Gosplan Collegium, Energy Commission, Presidium of the Council of Ministers, and the Politburo itself. The system manifestly evokes lobbying, coalition formation, and the co-option of potential opponents.

- Trends in "opinion," partly orchestrated from above, but partly crystallizing from below in a Soviet-style "bandwagon" fashion, can influence decisionmaking—especially in a policy area in which nobody is fully in charge and the issues at stake involve a host of uncertainties. []

The total effect of the environment, the motivation of decisionmakers, and the process by which decisions are made is to produce outcomes that are more the result of the play of bureaucratic and personal interests than of rational long-term calculation. The system tends to generate compromise decisions and to respond slowly to new situations. On the whole, incrementalism is the rule, and is expressed in the energy field—as elsewhere—through planning "from the achieved level." Campaign-type changes in the line of march are nevertheless possible and have repeatedly occurred.

III. Controversy Over Energy Policy: 1970-77

How to cope with the emerging energy problem has been seriously debated by Soviet specialists and economic officials since the early 1970s. A variety of



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strategies have been advocated (see the appendix for details), but because of the inherent complexities and uncertainties of energy issues, competing claims on resources, long R&D leadtimes, ineffectiveness of economic planning and management, and absence of cohesive political leadership in this sphere, no single strategy has dominated the field. Consequently, there has been substantial flux and vacillation in energy policy. [REDACTED]

The evidence indicates that, in fact, energy production policy decisions have not been dictated by some agreed-upon, comprehensive, and stable long-term program. There have been general notions about desired trends in the fuel-energy balance that have probably commanded fairly broad acceptance in the abstract, and there have been various sectoral energy R&D programs. But the sum of these has not been a "master plan." In recent years Soviet authorities themselves have complained, among other things, about:

- The absence of a long-term program for oil and gas production in Tyumen Oblast.
- Lack of a long-term program for further exploitation of the older oil regions.
- No program for offshore oil development.
- The absence of a long-term (10 to 15 years) plan for development of fuel-energy production.
- Avoidance of a basic decision on the regional pattern of refinery location.
- Continued delay in announcing the promised 15-year plan for the economy as a whole.
- Uncertain plans for gas pipeline construction in Tyumen.
- Neglect of forward planning in energy machine building.
- Inadequate treatment of economic criteria, capital investment effectiveness, and regional integration in energy planning.

- Failure to establish a center for coordinating the administration of the fuel-energy complex.

- Lack of territorial coordination of implementation of plans in Tyumen, Komi, Kansk-Achinsk, and other developing energy regions. [REDACTED]

Because of the short- to medium-term inertia of the energy balance, it has been of fundamental importance to the Soviets to adopt and stick to an integrated long-term energy production program. Only the direction provided by such a program can bring about the cumulation of incremental shifts in the energy balance that policy dictates as optimum. To a considerable degree, the inability to gear planning to this kind of a program arises from a failure to resolve a continuing argument over energy strategy. [REDACTED]

Alternative Strategies

The debate over production strategy has turned on the priorities that should be established among energy resources, the regions that ought to be developed, and the technologies that ought to be employed. The central question has been: how best, and in what proportions, should the Soviet Union's oil, gas, coal, hydro-, and nuclear-power resources be developed? [REDACTED]

The key responses given to this question since the late 1960s can be labeled the Hydrocarbon, Big Gas, Big Coal, and Combined Resources strategies. Naturally, they are not flagged this clearly in Soviet sources, and there is considerable overlap between the Hydrocarbon and Big Gas solutions, on the one hand, and the Big Coal and Combined Resources solutions, on the other. (In the appendix the latter two are treated together.) Nor are the approaches necessarily associated with a fixed group of proponents, because some officials have supported several approaches simultaneously or have changed their positions over the course of time, and top-level leaders have generally hedged their policy commitments. The main features of these approaches are shown on the foldout chart at the end of this paper. [REDACTED]

Over the past decade each of these strategies has been more or less constantly urged by at least some authorities, but has attracted more support and had more of an impact on the "party line" in certain periods than in others. The Hydrocarbon strategy completely dominated the field until the late 1960s, remained the official line until 1975, and then made a comeback in December 1977; Big Coal was urged by some in the 1969-70 period; Big Gas was seriously considered in 1970-75; and Combined Resources was in effect accepted as the new line in 1976-77. []

Hydrocarbons

The starting point in a consideration of contemporary Soviet energy production policy is the adoption as the official line in the 1950s of what we have dubbed the Hydrocarbon strategy. At the 21st Party Congress in 1959 the party leadership placed its stamp of approval on a major shift in the fuel balance away from coal and toward oil and gas, which were held to be more "progressive" because of their lower cost of extraction, ease of transportation, and use characteristics. In adopting this strategy the Soviets were also emulating the West, where oil and gas had displaced coal during the postwar period. Implementation of this decision has determined the dynamics of Soviet energy production up to the present day (see table 1). []

After Khrushchev's ouster, priority development of oil and gas was reaffirmed as the party line at the 23rd Party Congress in 1966 and was again endorsed at the 24th Party Congress in 1971. At the latter both Kosygin and Brezhnev declared themselves in favor of increasing the share of oil and gas in the fuel balance, and the Ninth Five-Year Plan (1971-75) projected a rise of oil and gas from a combined total of 60.4 percent in 1970 to 67.4 percent in 1975. This strategy remained the official position until the end of 1975, when a new line was introduced in a Politburo-approved set of directives for compiling the 10th Five-Year Plan (1976-80). Nevertheless, the strategy was seriously questioned both before and after 1970. []

Table 1

Percent

The Soviet Fuel Balance ¹

	Gas ²	Oil ³	Coal
1955	2.4	21.1	64.8
1956	3.0	23.3	63.2
1957	4.0	24.5	61.2
1958	5.5	26.3	58.8
1959	6.4	28.1	56.1
1960	7.9	30.5	53.9
1961	9.7	32.4	50.5
1962	10.9	34.2	48.8
1963	12.4	34.8	45.9
1964	13.9	35.1	44.2
1965	15.5	35.8	42.7
1966	16.5	36.7	40.7
1967	17.2	37.8	39.4
1968	17.9	39.2	38.0
1969	18.3	39.9	37.3
1970	19.1	41.1	35.4
1971	19.5	41.8	34.6
1972	19.5	42.3	34.0
1973	19.9	43.2	33.0
1974	20.8	43.8	32.1
1975	21.8	44.1	30.8
1976	23.1	45.1	29.0
1977	23.7	45.2	28.1
1978 ⁴	24.5	45.4	27.0

¹ Sources: *Narodnoye khozyaystvo SSSR*, various issues.

² Natural and associated.

³ Including gas condensate.

⁴ CIA estimate.

Coal

In 1969-70 a group that included Academicians Mel'nikov and Styrikovich and Minister of Coal Bratchenko came to the conclusion that the long-term prospects for oil and gas were inadequate to meet future energy needs. This group is said to have submitted a report to the Politburo during the drafting of the Ninth Five-Year Plan which in effect argued the case for Big Coal: Kansk-Achinsk should be developed, and coal substituted for oil and gas. The Politburo reportedly rejected this proposal on the grounds of excessive cost and decreed that Kansk-Achinsk development should be put off 20 to 25 years unless a



Boris Bratchenko
Minister of Coal



Boris Shcherbina
Minister of Construction of
Petroleum and Gas Industry Enterprises

breakthrough in transportation occurred in the meantime, thus ending any immediate prospects for Big Coal. [redacted]

Gas

By the second half of the 1960s the magnitude of natural gas reserves in northern Tyumen had become apparent, and arguments in favor of a Big Gas strategy began to be voiced. One of the earliest proponents of rapid development of these deposits was the then first secretary of the Tyumen oblast party committee (obkom) and present Minister of Construction of Petroleum and Gas Industry Enterprises, Boris Shcherbina, who has steadfastly adhered to this position up to the present. Even in 1965 Shcherbina argued that a Big Gas system based on Tyumen gas should be given priority over Central Asian gas development. Since that time he has repeatedly insisted that natural gas provides a way of introducing a fundamental shift in the Soviet energy balance. Along with Bogomyakov, his successor as Tyumen obkom first secretary, Shcherbina has resolutely defended the

use of natural gas as a boiler fuel. Over the years, both have also lobbied for the construction of a set of giant gas-burning thermal stations in Tyumen Oblast that would transmit power west over high-voltage lines. [redacted]

In the second half of the 1960s there were signs the Soviet leadership was indeed considering the Big Gas option. In 1970, construction began on the "Northern Lights" pipeline from Medvezh'ye in northern Tyumen to the Moscow region. However, gas plans began quickly to be scaled down, and it became clear in 1971 that the leadership had backed off from targeting a sharp increase in gas production in the Ninth Five-Year Plan (1971-75). The question of a major surge in gas production was nevertheless still under active consideration. In 1972 the Ministry of Gas and other organizations were ordered to design a so-called Big System that would "solve" the Soviet energy problem to the year 2000 by delivering 300 billion cubic meters

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of gas a year to the Urals and European USSR through 10 large-diameter trunklines. The cost estimates of this project (reportedly 22 billion rubles and 20 million tons of steel) led to its rapid abandonment. [REDACTED]

At this juncture, the search for a less expensive means of exploiting Tyumen gas turned to both foreign assistance and technological innovations aimed at reducing the cost of pipeline transport. It appears that between 1972 and 1974 the Soviet leadership seriously hoped that the proposed North Star and Yakutiya deals involving Western participation would provide a means of acquiring the financial resources, large-diameter pipe, and compressors needed to lay the foundation of a Big Gas strategy. Simultaneously, attention began to be focused on a proposal to transport Tyumen natural gas in hydrate form through a capsule pipeline system. [REDACTED]

Both ideas were vigorously opposed by Minister of Gas Orudzhev. Orudzhev has persistently tried to slow down gas development in Tyumen in order to moderate the attendant production and delivery problems, which fall upon his own shoulders. He has rejected the Big Gas strategy on the grounds that gas, as a valuable nonrenewable resource, should not be burned as a boiler fuel but should increasingly be used solely as a feedstock for the chemical and petrochemical industries. His opposition to the North Star deal was also couched in patriotic terms of defense of the national patrimony—an argument considered specious by knowledgeable Soviet observers, but one which did have some political resonance. Orudzhev came down strongly in the mid-1970s on the side of developing the Orenburg gasfield, which, although far smaller than the northern Tyumen deposits, involved fewer difficulties because of its favorable location and could be rationalized as a response to the objective requirements of supplying Eastern Europe with energy. Passage of the Stevenson Amendment by the US Congress in 1974 effectively ended Soviet hopes of implementing a Big Gas strategy based upon foreign credits. [REDACTED]

Initially, the prospect of achieving a breakthrough in gas transportation by means of technological innovation had been looked upon favorably both in Gosplan and the Academy of Sciences. Baybakov himself in the



Sabit Orudzhev
Minister of Gas

1973-75 period strongly supported R & D work on the capsule transmission of gas and on a new multiwalled gas pipe. As the time drew near to make decisions on the 10th Five-Year Plan (1976-80), however, the enthusiasm for gas began to wane—especially on the part of key Academy of Sciences energy advisers like Styrikovich, Mel'nikov and Melent'ev. Baybakov continued to support the idea of accelerated gas production, but insisted that implementation of such a strategy would depend upon achievement of a significant reduction in the cost of gas transport. [REDACTED]

In the fall of 1975 the Big Gas approach was still sufficiently alive, according to one report, to be reflected in a preliminary version of the section on gas in the draft document that set out the leadership's economic strategy for the next five-year plan: *Basic Directions of Development of the Economy of the USSR for the Years 1976-1980*. The preliminary draft

X1 is said to have contained a long passage on Urengoy and development of a capsule system that would transport Urengoy gas on a massive scale to the European USSR. When the draft was published in December 1975, however, this entire passage was omitted. Motivated partly by fear of relying on an untested and risky new technology, partly by high investment costs in gas transport and demands on the metallurgical industry, and partly—perhaps—by personal factors (see the appendix), the leadership once again retreated from a big commitment to gas. []

X1 Failure to endorse rapid Urengoy development explicitly in the five-year plan for 1976-80 appears to have left the whole issue hanging in 1976 and 1977. There was clearly an intention to begin production and build some pipelines from Urengoy during the five-year period, but the evidence suggests that uncertainty over the pipeline routes and pace of development existed up to the second half of 1977. []

X1 This inability to score a breakthrough in gas may represent a critical lost opportunity for the Soviets. It is possible that the failure to develop the gas industry more rapidly in the 1970s will substantially constrain the leadership's capacity to deal effectively with the looming energy crunch of the early 1980s—that is, to effect a meaningful substitution of gas for oil in the domestic economy and to cope with the tradeoff between East European energy needs and Soviet requirements for hard currency.²⁵ In the longer run, failure to move more rapidly on gas in the 1970s may have damaged Soviet chances of successfully bridging the period until Kansk-Achinsk coal and nuclear power will—it is hoped—reduce dependence on hydrocarbons. []

Hydrocarbons, Coal, and Nuclear Power

X1 As we have seen, by the late 1960s there was already a conviction in some circles that the conventional strategy of increasing the share of hydrocarbons in the fuel balance was no longer viable, and an unsuccessful attempt was made to include major development of the Kansk-Achinsk coal basin in the Ninth Five-Year Plan

²⁵ The relative growth of gas production in the 1970s was, of course, quite respectable. Given the cost factors inhibiting a still faster expansion, many Soviet authorities were probably quite satisfied with the rate achieved. See *USSR: Development of the Gas Industry*, ER 78-10393, July 1978. []

(1971-75). The Politburo's rejection of this proposal in 1970 only temporarily deflected interest in shifting the fuel balance away from hydrocarbons. []

25X1 There was no question in the minds of critics of the Hydrocarbon strategy that Kansk-Achinsk coal was a critical factor. Differences of opinion did exist, however, over its precise role. It appears that only a minority of coal boosters, most visibly represented by the scientist Chukhanov, believed that there was no alternative to an exclusive Big Coal approach and maximum immediate reliance on Kansk-Achinsk. The majority thought that there was less possibility of substituting coal for hydrocarbons in the short run than did Chukhanov, but much greater scope for nuclear power development in the longer term. From this perspective, development of Kansk-Achinsk coal represented a current strategic goal aimed at meeting midterm energy demand, within the context of a phased integration over time of hydrocarbons, coal, and nuclear energy resources. While some of the proponents of this Combined Resources approach had a vested professional interest in coal development, a majority had a stake in either nuclear power or nuclear and coal-based MHD power generation. The latter group included chairman of the State Committee for Science and Technology, Kirillin, and Academicians Styrikovich, Melent'ev, and Sheyndlin—all of whom were linked with the Institute of High Temperatures, the peak MHD research organization. []

25X1 Between 1973 and 1975, intense examination of energy production policy took place in the Academy of Sciences, the State Committee for Science and Technology, and Gosplan, and by 1975 a strong consensus of opinion had crystallized among top-level energy advisers that an accelerated development of coal production, MHD, slow neutron and breeder reactors, and fusion power was necessary.²⁶ Following heavy lobbying, this opinion was directly reflected in the Politburo-approved set of directives for compiling the 10th Five-Year Plan (1976-80). This document provided the framework for Kosygin's report on the Plan

²⁶ At the same time there have reportedly been sharp conflicts within this community over the share of resources allocated to various elements (for example, fusion versus fission power) and over the control of research and development programs. Combined Resources supporters in no way constitute a monolithic bloc. []

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X1 to the 25th Party Congress in March 1976 and for the Plan finally adopted at the October 1976 session of the Supreme Soviet. [redacted]

In his report to the party congress, Kosygin prefaced his remarks on the fuel-energy complex with a comment that was later to be frequently quoted by those in favor of an autarkic energy policy. "The Soviet Union," he said, "is the sole large industrial state in the world that bases its economic development on its own fuel-energy resources. This is a serious advantage of our economy and a quite important precondition of its steady growth." But in order to retain this advantage, Kosygin in effect argued, it was necessary to begin shifting the fuel-energy balance:

In this five-year plan the foundations will be laid for future growth of our energy potential primarily on the basis of hydroelectricity, atomic fuel and cheap coal. As regards oil and gas, the growth of their extraction will to an ever greater degree be directed to technological needs. [redacted]

X1 Accordingly, the combined share of nuclear power and hydroelectricity in the capacity of new electric power stations would rise from 22 percent in the Ninth Five-Year Plan to 40 percent in the 10th Five-Year Plan. Coal would begin to play an increasing role in supplying the country with fuel and electrical energy:

Already in the 10th Five-Year Plan the use of Ekibastuz and Kansk-Achinsk coal will be considerably expanded for production of electrical energy, and a number of large thermal electric power stations in the Urals and Volga regions will be converted from fuel oil to coal. For this purpose further development of the coal industry is planned, especially opencast extraction of coal in the Ekibastuz, Kansk-Achinsk, Kuznetsk, and South Yakutsk basins.

Gas production would increase 50 percent by 1980, but its use for technological purposes—as opposed to power production—would double. To meet the "ever-growing needs" of the European USSR and Urals for fuel and electrical energy, a big program of nuclear power station construction in the western part of the country would be combined with accelerated construction in the east of large thermal power stations burning

coal mined in Kazakhstan and Siberia, the power from which would be transmitted to the European USSR through the Single Electric Power grid. In contrast to his emphasis on coal and nuclear power, Kosygin had virtually nothing to say about oil production over the next five years. [redacted]

The line expressed by Kosygin in March 1976 was reflected in the official resolution of the party congress, and in the report that Baybakov delivered upon the actual adoption of the 10th Five-Year Plan in October.²⁷ Throughout 1977 there were no indications that the official position had changed. With some shadings of emphasis it appeared to be accepted as a given in public statements by such luminaries as Central Committee Secretary Kirilenko, President of the Academy of Sciences Aleksandrov, and Academician Styrikovich. [redacted]

Nevertheless, implementation of the new line was very slow. A fundamental problem was how to go about actually utilizing the enormous potential energy of Kansk-Achinsk coal.²⁸ There has been general agreement that some of the coal should be burned in mine-mouth generating plants to supply power for local needs. Beyond this point, different opinions on the desirable mode of transmitting Kansk-Achinsk energy were expressed both before and after adoption of the 10th Five-Year Plan. There have been proposals to build large mine-mouth generating stations and transmit electric power over superhigh-voltage lines to the European USSR; to build a special broad gauge coal railway from Kansk-Achinsk to central Russia; to build a slurry or capsule pipeline; to build a superconductive cable; and to build coal liquefaction,

²⁷ It should be stressed that the line was that the groundwork would be laid for a *future* increase in the share of coal in the fuel-energy balance, *not* that the share of coal would increase during the 10th Five-Year Plan. In other words, the initial objective was simply to slow down and then stabilize the share of oil. Thus the plan in fact foresaw a *decline* in the share of coal in the overall energy balance from 30 percent in 1975 to 26 percent in 1980, with a slight *increase* in the share of oil from 43.0 percent to 43.1 percent. The share of coal in boiler fuel was likewise expected to drop from 32.9 percent to 29.5 percent, and only a slight drop from 18.3 percent to 17.4 percent was projected in the share of oil. (A. M. Nekrasov and M. G. Pervukhin [eds.], *Energetika SSSR v 1976-1980 godakh* [Moscow, 1977], p. 149.) [redacted]

²⁸ Kansk-Achinsk brown coal has low calorific value, high water and ash content, and tends to self-ignite when transported over relatively short distances without enrichment. [redacted]

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X1 gasification, or semicoking facilities, with the product either being shipped west or used as an enriched fuel for power generation. []

X1 Each of these variants is extremely costly, and most involve high levels of technological risk and extremely long R&D gestation periods. Apparently, the most appealing option has been the construction of a 2,200-kilovolt DC superhigh-voltage line from Kansk-Achinsk to the European USSR. However, before this technological feat can be accomplished, the effectiveness of a projected Ekibastuz-Center 1,500-kV DC line will probably have to be studied. The indications are that a Kansk-Achinsk - Center line will not be in operation before 1990 at the earliest. []

X1 The notion that Kansk-Achinsk development would make any significant contribution to the Soviet energy balance before 1980 was evidently discounted almost immediately after the 10th Five-Year Plan was adopted—if not before—by such key figures as Minister of Coal Bratchenko, Minister of Power and Electrification Neporozhnyi, and Baybakov himself. The de facto strategy that emerged in the first two years of the current five-year plan was to press ahead on Ekibastuz coal extraction, to assign priority to design and construction of the 1,500-kV DC Ekibastuz-Center transmission line, to develop very gradually the third extraction site in Kansk-Achinsk (the Berezovo coalfield), and to look in the medium run toward a link-up of Kansk-Achinsk with the Kazakhstan power grid by means of a 1,150-kV AC line—which would permit a roundabout transfer of a small amount of Kansk-Achinsk power at least to the Urals until the Ekibastuz-Center line goes into operation. []

X1 Not surprisingly, discussions of Kansk-Achinsk since 1976 have exhibited considerable ambivalence. The decision in the 10th Five-Year Plan to go ahead with Kansk-Achinsk, even though the transportation issue remained unresolved, has led some authorities to redefine the central function of Kansk-Achinsk by emphasizing its role as the hub of a vast energy-intensive industrial complex to be formed in Krasnoyarsk Kray. This point of view, which has been

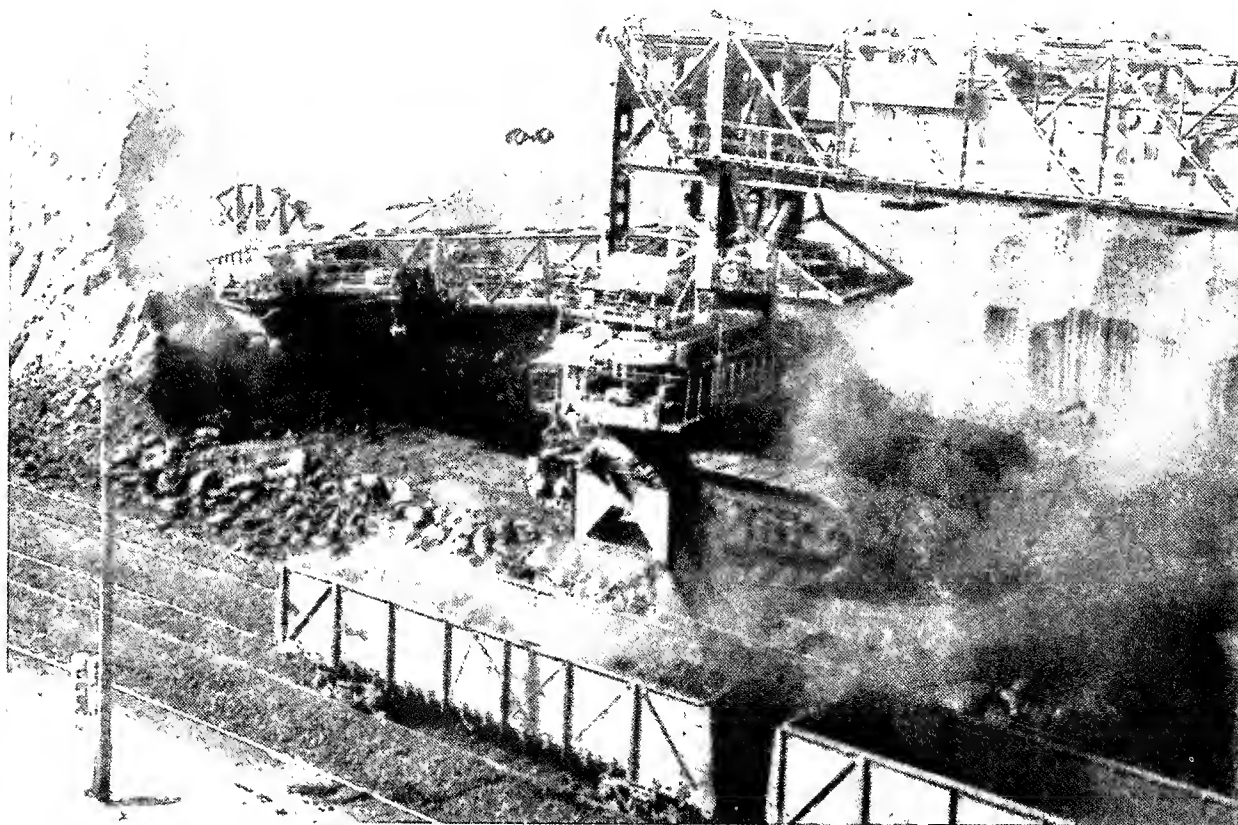
publicly articulated by Mazover and Nekrasov of Gosplan's SOPS, implies an extremely bullish attitude toward Siberian industrial development, but by the same token suggests that Kansk-Achinsk coal will not solve the critical European USSR fuel deficit in the foreseeable future. Meanwhile, others—including some Gosplan officials—continue to emphasize transportation of Kansk-Achinsk energy to the western regions of the USSR. []

In practice, some progress has been achieved in Ekibastuz during the present five-year plan, and it is claimed that the technology of 1,500-kV DC transmission has now been mastered and that actual construction of the line is about to begin. Reports from Kansk-Achinsk, however, indicate that while a few broad output targets have been set, no comprehensive development program for the region existed as late as 1977. Despite efforts by the Krasnoyarsk obkom to generate such a program and to establish some mechanism for coordinating the activities of the dozens of agencies involved in developing Kansk-Achinsk, the familiar pathology of malcoordination at the regional level has emerged full-blown. Each ministry goes its own way, guided by its own vested interests, and vital long-term development needs are simply ignored. There is no evidence that the leadership in Moscow was prepared to intervene decisively to change this situation in the period prior to the December 1977 Plenum of the Central Committee, when the party line adopted only two years before was suddenly revised. []

IV. The Present Situation

The December Plenum of the Central Committee

A reappraisal of Soviet energy production policy undertaken in the second half of 1977 was conducted so secretly that most authorities were evidently caught



Strip mining coal at Ekibastuz

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off guard by the change in line at the December Plenum of the Central Committee.²⁹ We do not know precisely why this shift in the line occurred, but among the likely reasons are:

- Recognition that the oil reserve situation had become quite serious. Despite earlier assertions that oil production could be maintained only if giant new oilfields were discovered, none had been found by 1977. By the end of 1977 there was no conceivable way of bringing in a giant field in time for the 11th Five-Year Plan. Meanwhile, geologists in Tyumen for the second straight year were failing to fulfill the plan for increasing reserves, and there were reserve difficulties elsewhere as well. Anxiety of specialists over oil reserves in 1977 was already profound, and their concern probably increased.

- Worsening performance in oil production in 1976-77. In 1976, seven oil regions did not fulfill their plans, and the Ministry as a whole did not fulfill the "supplementary targets" that had been laid on it. In 1977 the Oil Ministry failed to fulfill its above-plan "obligations," and six administrations—including two in which the Soviets had invested some hope (Perm and Orenburg)—did not even meet their plans. In Tyumen the duration of drilling downtime increased twofold over 1976, the plan for transfer to mechanized extraction was not fulfilled, the plan for introduction of new production capacity was fulfilled by only 86 percent, and the plan for nonproduction construction was also unfulfilled. There was also a sharp drop in pressure at the Fedorovo field. [redacted]

²⁹ In late July or early August a delegation consisting of the Ministers of Oil, Gas, and Construction of Petroleum and Gas Industry Enterprises, other ministerial and Central Committee officials, and probably Gosplan Chairman Baybakov made a secret visit to Tyumen. This was a procedure that had preceded earlier policy changes related to Tyumen. There were also some significant personnel shifts in 1976 and 1977. Vladimir Kremnev, a former Central Committee official responsible for petroleum was appointed First Deputy Minister of Oil in July 1977, and there appear to have been three other top-level changes in the Ministry of Oil in 1977, as well as a number of changes in the leadership of territorial oil production administrations. Yurii Erv'e, former head of the Tyumen Geological Administration (Glavtyumengeologiya), was appointed Deputy Minister of Geology in December 1977. There also seems to have been a major shakeup in the Gosplan Transport Department during the course of 1977. In 1976, Vladimir Filanovskii, formerly of Tyumen, appears to have replaced Pavel Galonskii as head of Gosplan's Petroleum and Gas Industry Department. [redacted]

• Possible anticipation of a more rapid decline than projected in oil output in the older oil-producing regions.³⁰

• Probable nonfulfillment of its 1977 plan by the Ministry of Construction of Petroleum and Gas Industry Enterprises.

• Possible anticipation of a more rapid decline than projected in older gasfields (for example, in Central Asia).

• A general intensification of energy shortages: power plant fuel shortages, petroleum shortages, and failure to fulfill energy conservation measures.

• Unimpressive performances in the coal and nuclear energy sectors in 1976-77. [redacted]

The Central Committee Plenum and the Supreme Soviet session on the plan and budget for 1978 were held successively in mid-December 1977. None of the speeches delivered at the Central Committee plenum were published, and substantial secrecy still surrounds the proceedings; the main evidence of what was said is a *Pravda* editorial paraphrase of Brezhnev's speech, published after the conclusion of the Supreme Soviet meeting.

The general context in which the energy issue was posed was evidently one of extreme pressure on all resources, especially metals, fuels, and investment funds. Brezhnev's response to this situation was to insist upon the establishment of strict priorities and a funneling of investment into "those concrete links in which, at the cost of minimal expenditures, one can get a maximum and rapid effect.

³⁰ Oil production at the large Tuymazy field in Bashkiriya had declined from 400,000 barrels a day to 80,000 over the past five or six years, causing great concern among petroleum officials. Authorities also foresaw the possibility of a steep decline in Tatar production. [redacted]

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In other words, Brezhnev resurrected the old notion of "leading links" in the economy, so familiar to all who had participated in economic campaigns of the Stalin years—a notion that contrasted with the marginalist, optimizing thinking that lay behind the 25th Party Congress directives on energy. [REDACTED]

The key passage dealing with energy in *Pravda's* presentation of Brezhnev's speech declared:

Among the big interbranch problems there is none more important than the fuel-energy problem. Over the next 10 years . . . oil and gas, first of all from Tyumen, will retain a decisive role in providing the country with fuel and energy. We have successfully completed the first stage of the program of the complex mastery of the mineral resources and development of the production forces of West Siberia. Now with all urgency arises the need to realize the next stage. It is important to concentrate resources and capital construction possibilities on this truly great construction project of our time, to buttress economic with mass-political measures, having strengthened attention to it on the part of the Komsomol and the press.

Coal will continue to occupy an important place in the fuel-energy balance of the country in the future too, the extraction of which will rise in 1978 to 746 million tons. . . . Hydro- and atomic energy will develop at exceptionally rapid tempos. [REDACTED]

The "leading links" here were clear: within the nonagricultural economy, the leading link was the fuel-energy sector; within this sector the leading link was hydrocarbons; and within the hydrocarbon branches the leading link was development in Tyumen Oblast. The concept of a "first stage" of Tyumen development appeared here for the first time, although it had been implied in a general way by what Muravlenko and other advocates of heavier investment in Tyumen had been saying in 1975-76. The purpose of the phrase was precisely to justify a major increase in the resources allocated to Tyumen. The phrase "all urgency" was intended to convey a sense of critical need without at the same time undercutting the carefully nurtured

propaganda image that the Soviet Union was not vulnerable to—much less in the midst of—its own "energy crisis." The references to "mass-political measures," the Komsomol, and the press signaled the initiation of a campaign. And the tag-end reference to coal, hydroelectricity, and nuclear power maintained the facade of continuity with the 25th Party Congress, despite the actual shift in the whole policy emphasis. The *Pravda* report, however, was short on details: although it called, in effect, for a return to what we have called the Hydrocarbon energy balance strategy, it did not spell out how much stress was to be placed on north Tyumen gas or how—in a broader sense—the new policy line was to be implicated. [REDACTED]

One might have expected to find such details in Baybakov's report on the 1978 plan to the Supreme Soviet, but at most they were merely suggested. Baybakov did talk about the need to increase oil and gas reserves and the need to accelerate pipeline and housing construction in West Siberia. But he also declared that the increase in oil output in 1978 would come not only from Tyumen but from other regions; that gas development would occur in Orenburg, and also in Turkmenistan, as well as in Tyumen; that coal production should be increased in the Donbass, Kuzbass, and Ekibastuz (he ignored Kansk-Achinsk); that work should go forward on the 1,150-kV AC line; that nuclear power development should proceed apace; and—by implication—that the needs of other major investment projects, such as Atomash, the Baykal-Amur Mainline (BAM), and non-Black-Earth development, had to be kept in mind. What Baybakov did not say was even more significant: he did not mention the Central Committee Plenum at all in the energy section of his report; he did not say that Tyumen had special priority; he did not mention Urengoy at all, although he specifically mentioned Orenburg three times; and he did not in any way suggest or imply any change in the energy line established at the 25th Party Congress. [REDACTED]

There was thus a sharp apparent contrast in December 1977 between the position attributed to Brezhnev, which was held to be the party line, and the course of action projected in the 1978 economic plan. The divergence here could have been explained by underlying conflict over policy, but it might also have arisen from lack of time to meld the draft report on the

plan with a conceivable last-minute shift by the Politburo. On balance, later evidence tends to support the conflict interpretation. However, Brezhnev's illness in the second half of December and almost all of January and his apparent absence from the scene on many days in November, February, and March cloud the picture. [redacted]

What is clear is that the December Plenum of the Central Committee specifically confirmed nothing more than a shift in direction of energy policy, and even this was not immediately given great publicity. No detailed program was approved by the Plenum, and the entire weight of Politburo authority appears not to have been placed behind the Tyumen campaign until after Brezhnev returned in April 1978 from his trip to Siberia. Especially in December and January there were signs that the full measure of the forthcoming campaign had not been taken, even by supporters of such a change.³¹ [redacted]

Crystallization of the New Line

In the interval between the December Plenum and Brezhnev's trip the openness of policy was suggested by intense lobbying efforts on behalf of investment in Tyumen. Two weeks after the Plenum, Shcherbina was the first person publicly to claim that the Plenum had in fact introduced a new "strategy" for "further development of fuel-energy." In the 11 January issue of *Literaturnaya gazeta*, the first secretary of the Writers' Union, Georgi Markov, was one of the first to quote in full the 18 December *Pravda* version of Brezhnev's remarks on Tyumen, as he announced a major literary-propaganda blitz aimed at Tyumen. In

³¹ In an article on Tyumen oil in *Pravda* on 16 December 1977, a journalist favorably predisposed to Tyumen did not even hint that a "Tyumen acceleration" had been approved at the Central Committee Plenum. Likewise, an article by the ardent Tyumen advocate, Academician Trofimuk, in *Pravda* on 4 January 1978 contained no reference to the December Plenum, to Brezhnev's support for Tyumen, or to the "second stage" of Tyumen development. A major propaganda "letter" of the Central Committee, the Council of Ministers, and the Trade Unions published in *Pravda* on 14 January failed to refer at all to the Siberian thrust or to Tyumen. Similarly, at a Central Committee mass media meeting reported in *Izvestiya* on 19 January, Kirilenko, who mentioned the December Plenum and Brezhnev's "propositions and conclusions," did not allude to the Tyumen-first policy; nor was this noted as one of the themes stressed at a meeting of the Council of Ministers attended by Kirilenko and Mazurov that was reported in *Pravda* on 26 January. [redacted]

the following week's issue of *Literaturnaya gazeta*, the Tyumen obkom first secretary, Bogomyakov, argued forcefully that the December Plenum had indeed ushered in a new era in energy production policy, although only after a period of unnecessary vacillation:

Tyumen workers are orienting themselves to produce not less than 305 million tons of oil and 155 billion cubic meters of gas in 1980. But what about after that? How will extraction be increased? This question undoubtedly worries many people. Even quite recently there were not just a few contradictory judgments in views on the future. The directives of the December Plenum of the Central Committee CPSU determine precisely the place of the Tyumen complex in satisfying the needs of the country for oil and gas.

Bogomyakov laid the blame for past inefficient development of Tyumen and for the need to undertake the present catch-up campaign on Gosplan and various ministries. Other articles in the next few months also assigned blame for delays in Tyumen development, drew favorable comparisons between Tyumen and other energy-producing regions, and called for a further shift of resources to Tyumen. [redacted]

But the element of uncertainty that remained following the December Plenum provided room for the assertion of interests that crosscut Brezhnev's evident intentions. Even at the Supreme Soviet session, the representative of the Tatar Republic spoke far less enthusiastically of Brezhnev's initiative at the December Plenum than did his colleague from the Bashkir Republic, whose categorical endorsement suggested behind-the-scenes conflict. The Turkmen spokesman explicitly complained of cutbacks in Turkmenistan's 1978 oil program. [redacted]

Had these speeches simply been insufficiently coordinated beforehand? The answer—at least in the case of Tatariya—would appear to be negative. In early January, Bulgakov, the general director of the Tatar Oil Administration, referred publicly to the need to redrill three out of every four wells in Tatariya. At the end of the month, at the annual winter meeting of the

Oil Ministry Collegium, he dwelt on the need to increase the recovery rate in Tatariya, bring small fields into production, and supply more drilling equipment, and he also observed that "the problem of holding on to cadres seriously disturbs us." It was precisely at this time that the campaign to dispatch Tatar and other drilling crews to Tyumen was gaining momentum—a development with which Bulgakov himself was intimately involved. [REDACTED]

The ambiguity surrounding the new policy line was not altogether dissipated by the trips in quick succession to Tyumen and other Siberian cities by Kosygin and Brezhnev in March and early April 1978. Kosygin left on 21 March and returned on the morning of 28 March, while Brezhnev left several hours after Kosygin's return and came back to Moscow on 9 April. [REDACTED]

Kosygin was accompanied by Baybakov, Dymshits, and "a number of USSR ministers," who probably included at least Mal'tsev, Orudzhev, and Shcherbina. The composition of the delegation, which may well have represented a rump gathering of the Energy Commission of the Council of Ministers Presidium, strongly suggests that its mission was to work out the implementing details of the December Plenum directives. The fact that three months had elapsed before this delegation departed, despite Brezhnev's admonition that Tyumen development should be treated "with all urgency," suggests that decisionmaking was held back by the absence of prior contingency planning, conflict over policy, Brezhnev's feeble health, or some combination of these factors. [REDACTED]

Kosygin's delegation visited Orenburg (where it dealt with gas questions), Tyumen city, the two key Tyumen oil towns of Surgut and Nizhnevartovsk (Samotlor), and Tomsk and Krasnoyarsk. Press comment on what happened in Tyumen was exceedingly sketchy; the only substantive information released was that questions related to the long-term development of Tyumen had been discussed at gatherings of party and government officials and specialists from the oil, gas, and petrochemical industries. There was somewhat more comment on Kosygin's visit to Krasnoyarsk. It focused

on development of the Sayan Territorial Production Complex, natural resources, agriculture, and the broader pattern of Siberian development. There was no mention of Kansk-Achinsk. [REDACTED]

Brezhnev's visit to Tyumen was also treated circumspectly in the press, receiving the least coverage of any of the major stops on his tour despite the paramount importance of the oblast. In his talk with Tyumen party and economic leaders, the press indicated, Brezhnev dwelt on "fulfillment of plans for mastering mineral resources and developing production forces," expanding the output of oil and gas, economizing on material resources, and meeting capital construction targets. He also issued unspecified "concrete directives." A bit more information was added in the account of Brezhnev's stop in Novosibirsk, where he was reported to have demanded of the Siberian Division of the Academy of Sciences, "We expect still more in questions of the practical application of science and in the solution of fuel-energy problems, geological exploration, petrochemicals, machine building, and in other areas." In a long and relatively detailed report of his speech in Krasnoyarsk, there was no mention at all of Kansk-Achinsk, in contrast with a pointed reference to the subject by the kraykom first secretary, Pavel Fedirko. [REDACTED]

Perhaps the unprecedented visit to the same remote province by two top leaders within a week's time was the result merely of the fortuitous circumstance that going through Tyumen is one way to take the Trans-Siberian railway to the Pacific. Having initiated a "turn toward Tyumen" at the December Plenum, one might argue, it was only natural for Brezhnev to stop in the oblast for a firsthand appraisal and for a pep talk that would reinforce the message delivered by Kosygin and his associates. From this perspective, the stop would be viewed simply as an episode within the framework of the broader personal, economic, and geopolitical considerations that led Brezhnev to travel across Siberia: to demonstrate physical and political vitality, push Siberian development, focus attention upon Soviet military might vis-a-vis the Chinese, and address the Carter administration on issues relating to strategic arms limitation. [REDACTED]

An equally plausible explanation, however, is that the Kosygin-Baybakov-Dymshits and Brezhnev-Ustinov visits represented two different approaches to dealing with Tyumen. A noteworthy anomaly of the trips was the near coincidence of the return of Kosygin and the departure of Brezhnev. The timing here would appear to have allowed little opportunity for face-to-face consultation between the two. Had Brezhnev been working in harmony with Kosygin and Baybakov, one might have supposed that he would have delayed his departure long enough for discussion and coordination of his own positions with those arrived at by Kosygin's delegation. [redacted]

That there *were* high- and lower level differences of opinion over Brezhnev's new line, which may or may not have surfaced in the separate trips to Tyumen, is strongly suggested by a convergence of other evidence:

- *Baybakov's attitude.* In a long article on technological progress that was published in January, Baybakov managed to avoid any reference to the December Plenum or to Brezhnev, while stressing the desirability of heeding professional advice. Likewise, in a July article on economic "effectiveness" he completely ignored the subjects of Siberia and oil and gas.

- *Gosplan-based negativism.* One of the most striking manifestations of disagreement with the Brezhnev line was provided by the publication of two articles by Yatrov, the director of Gosplan's Scientific Research Institute of Complex Fuel-Energy Problems. The first, printed two days after Brezhnev's departure for Siberia, constituted a thoroughgoing restatement of the 25th Party Congress Combined Resources line on energy production, with no stress on Brezhnev's role or on the Siberian campaign, and no specific reference to Tyumen. Without identifying the source, Yatrov included an entire paragraph taken from Kosygin's report to the 25th Party Congress stressing the USSR's status as the only energy self-sufficient major world power.³² Yatrov's second article, devoted to the offbeat

³² *Krasnaya zvezda* 30 March 1978. The article bracketed references to Brezhnev and the December Plenum between references to the 25th Party Congress and the December 1977 session of the Supreme Soviet (at which Baybakov had virtually ignored Brezhnev's line) and asserted in unmistakable terms that the line had been set "by the 25th Party Congress." While touching upon Brezhnev's theme of the paramount role of oil and gas in the next decade, and mentioning West Siberia (along with Komi and Orenburg), Yatrov devoted much more attention to Kansk-Achinsk and Ekibastuz coal, as well as to MHD and nuclear power. [redacted]

subject of geothermal energy, also ignored Brezhnev and the role of oil and gas. In addition, an article reiterating the 25th Party Congress line was published in the May issue of Gosplan's journal, and an article tilted toward a Combined Resources approach appeared in the June issue of a journal closely tied to Gosplan.

- *Clashing Pravda and Izvestiya editorials.* Historically, *Pravda* has often tended to reflect party-oriented positions, while *Izvestiya* has reflected opposed thinking in the government Council of Ministers. Following Brezhnev's return, *Pravda* and *Izvestiya* published their own editorials on the Siberian trip. Overall, the *Izvestiya* editorial was substantially less supportive than *Pravda's*.³³ The formal resolution approving Brezhnev's trip adopted by the Central Committee, Presidium of the Supreme Soviet, and Council of Ministers incorporated compromise language.

- *Brezhnev's remarks at the Komsomol congress.* The tone of Brezhnev's comments on Tyumen in his speech in April to the Komsomol congress was defensive and argumentative. He found it necessary on this occasion to justify the large investment in Tyumen and to argue that it had paid off. Tyumen was not a dead end: "We can still live off of Tyumen reserves for many years," he declared. But, it was necessary "to double-treble the volume of all operations there." He asserted that this would require both new material technical expenditures and an influx of people there, that supply orders destined for Tyumen originating elsewhere in the country should be given the highest priority, and that Komsomol groups should monitor fulfillment of this requirement.

- *Kosygin's promotion of Kansk-Achinsk.* In a report to the Presidium of the Supreme Soviet in May, Kosygin "drew attention, specifically, to the progress of realization of proposals for accelerating the elaboration and implementation of measures for setting up the Kansk-Achinsk fuel-energy complex, for increasing

³³ *Pravda* on 18 April 1978 and *Izvestiya* on 20 April 1978. The *Izvestiya* article had a weaker title than *Pravda's*; implied that less of a response was required from party meetings and activists that would now discuss the implications of the trip; stressed the 25th Party Congress; emphasized the need for regional balance; confined the "new stage" to East Siberia; mentioned coal; avoided saying that the share of allocations to the east would increase; and did not lay the blame for lagging development upon the ministries. [redacted]

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the reserve of capacities in the energy systems of the country." In his speech on the 61st anniversary of the Revolution in November, Kosygin ignored the December 1977 Plenum and West Siberia. Instead he emphasized raising the proportion of atomic energy and coal in the fuel and power balance, developing the Kansk-Achinsk and Ekibastuz coalfields, long-distance high-voltage power transmission, and economizing on gas and oil (the "irreplaceable sources of chemical raw materials").

- *Esoteric criticism of Baybakov.* The most significant implied criticism of Baybakov (and probably of Kosygin as well), although perhaps the most elusive, appeared in Brezhnev's memoir, *Rebirth*, published in May 1978. In a paragraph that was partly cribbed from a *Pravda* editorial of 18 December and lacked any relation to the historical material in which it was embedded, Brezhnev dwelt on the importance of concentrating resources on West Siberia and reiterated the "leading links" philosophy. Adherence to this philosophy constituted one of the key elements of "the art of planning, and indeed of economic leadership in general." A direct slap at Baybakov appeared during May in the Central Committee's theoretical journal, *Kommunist*, which called attention to the fact that the "Ministry of Oil" had liquidated geological prospecting in north Tyumen in 1953. Any Soviet reader with the slightest familiarity with the oil industry would have been aware that Baybakov had been Minister of Oil in 1953 and that he was being held responsible for a situation with obvious current parallels.

- *Debate at the roundtable meeting on West Siberian development.* In June 1978, discussion at a roundtable meeting on West Siberian development organized by the Tyumen obkom and the editorial boards of several

journals revealed the persistence of a number of key unresolved issues even after Brezhnev's trip to Siberia.³⁴ [REDACTED]

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Impact of the New Line

The priorities that have emerged in practice from Brezhnev's new line include an intensified emphasis on oil extraction in Tyumen, a secondary stress on gas, and a deemphasis of coal. It would almost certainly be incorrect, however, to say that these priorities are embodied in some coherent, comprehensive program. Following Politburo authorization in late 1977 of a reformulation of the regime's general energy production strategy, planners and specialists were faced with the task of generating, once again, branch programs that corresponded to prescriptions set from above. In the meantime, adjustments are presumably being

³⁴ The most fundamental issues dealt with investment, oil reserves, planning, and transportation. Investment issues that were raised included the effectiveness (or lack of it, according to some Gosplan officials) of capital investment in West Siberia; the desirability of broad (hydrocarbons plus petrochemicals and chemicals plus electric power plus metallurgy) versus narrow (hydrocarbons) development of Tyumen; the optimum rate of investment in infrastructure and prospects for long-term habitation of the region; conflicts of interest over investment between Tyumen and other regions; and the overall priority to be assigned to Tyumen investment. One economist, B. S. Vaynshteyn, was said to have emphasized that "the significance of the Tyumen complex is so great for the economy of the country, and the problem of providing it with all the necessary reserves is so important," that it was necessary "first to draw up a balanced plan for the oil-gas complex of Tyumen Oblast, and then include it as one of the basic blocks in the plan of development of the economy of the USSR. All the necessary 'input' resources of the Tyumen program must be satisfied under all conditions." This proposal, considered paradoxical by the editors, implicitly called for assigning Tyumen development a priority equivalent to military production. The issue of oil reserves and production possibilities was touched upon by the Tyumen geologist I. I. Nesterov, who called upon Gosplan to increase investment in exploratory drilling and denounced skeptics who doubted the existence of further large oil reserves in Tyumen and by the Tyumen economist L. P. Guzhovskii, who appealed for the "creation of strategic reserves in the oil-extraction industry" in order to compensate for unanticipated declines in oil production elsewhere. Guzhovskii was also one of the speakers who lamented the absence of an integrated program for West Siberia; in his opinion, failure by Gosplan (notoriously hostile to this idea) to employ optimizing mathematical models in planning West Siberian development was likely to result in enormously costly miscalculations. Transportation was stressed by Ya. Mazover of Gosplan's SOPS, who dwelt on the "gigantic problem" of coping with the rapidly increasing energy deficit in the western USSR. Mazover's pitch for a rapid acceleration of natural gas production and transportation was seconded by Nesterov, who urged that Soviet steel production capacity be enlarged in the 11th Five-Year Plan to meet the enormous need for large-diameter gas pipe. (See *Voprosy filosofii* 1978, No. 9 and *Planovoye khozyaistvo* 1978, No. 9.) [REDACTED]

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X1 made "by eye" in the existing plan balances, with no little pulling and hauling by interested ministries. []

In all likelihood the key factor that led to a reversion to the Hydrocarbon strategy was what a majority of leaders must have perceived as a clear and present danger of slippage in oil production. The "Tyumen acceleration" in the midst of the current five-year plan indicates that the Soviets appear to have been unable to meet immediate petroleum requirements while maintaining a policy commitment to longer term solutions to the energy problem. []

X1 The Hydrocarbon approach, of course, does have certain positive enticements. It imposes high costs, but these are lower than the immediate cost that would be entailed by a sudden implementation of the Big Gas or Big Coal strategies. It depends on familiar technology and does not demand the development of radically new and untested transportation systems. Probably it demands less foreign involvement than a gas-based strategy, as long as it does not include major offshore development.³⁵ Also, it lends itself well to the technique that can get *some* results under Soviet conditions—the party-led mobilizing campaign. []

The Present Tyumen Oil Campaign

X1 A central element in the present campaign is the reluctant decision to make substantial increases in investment in Tyumen. Commenting on this issue, the Tyumen obkom first secretary, Gennadiy Shmal', referred in March 1978 to the enormous costs that now had to be met in West Siberian development. The general magnitude of investment demands is indicated by the statement that "by the end of the five-year plan it will be necessary to fulfill capital construction work in West Siberia greater than that at BAM, KamAZ, VAZ and 'Atommas' taken together." Uncertainty or

³⁵ Soviet concern with offshore oil and gas development was manifested in the creation in August 1978 of a new Main Administration for Exploration and Development of Offshore Oil and Gas Fields. The establishment of this unit within the Ministry of Gas and the transfer to it of personnel from the Ministries of Oil and Geology reflect a major political victory for the Minister of Gas, Sabit Orudzhev. Whether the Ministry of Gas is as well suited to organize offshore production as the more experienced Ministry of Oil, which would have had a larger stake in it and which has a record of more expeditious handling of foreign trade and technology transfer, remains doubtful. []

conflict over the precise volume of investment is suggested by Brezhnev's ambiguous reference in his April 1978 speech at the Komsomol congress to the need to "double-treble" the amount of work in West Siberia. []

Constraints in the allocation of resources and personnel for geological exploration has been a sore point with Tyumen authorities for years. In 1976 and 1977 there were heavy hints of discrimination against Tyumen on this score, and a program to increase exploration was mounted in 1977. The 1978 target for exploration drilling by Glavtyumengeologiya was increased by a third over 1977. However, a top official of Glavtyumengeologiya indicated in March 1978 that his organization would be hard pressed to meet this goal.³⁶ One remaining critical issue was that of drilling teams for geological exploration, despite the apparent priority assigned to Tyumen by the December Plenum. In 1978 there were 56 geological drilling crews in Tyumen; to meet the 1980 drilling plan, according to a top official of Glavtyumengeologiya, there will have to be 100 crews. The persistence of competition between regions for personnel was illuminated by a remark of Farman Salmanov, chief of Glavtyumengeologiya, in May 1978:

I'm not convinced . . . by assertions that there aren't enough drillers. There are 2,300 drilling brigades in the branch, and so it's necessary to shift a considerable part of them there where exploitation will give the largest geological payoff; namely, to us, to the Tyumen land! []

Even more crucial in the short run is the need rapidly to increase oil development drilling in West Siberia. In 1977 this was clearly an area of deep concern to the Soviet authorities. Still greater anxiety was suggested in 1978, when the real magnitude of the oil drilling required to meet the five-year plan was disclosed. On the basis of data released in 1978 the picture of drilling requirements given in table 2 came into focus. It is apparent that to meet the five-year plan target it would

³⁶ The problems mentioned included major difficulties with equipment repair, unexpectedly high pressures that brought drilling to a standstill in northern regions, and a high frequency of breakdowns in drilling operations. The official strongly implied that "a concern for the longer term" was not characteristic of the way exploration in Tyumen was being dealt with by higher authorities. (*Sotsialisticheskaya industriya*, 3 March 1978.) []

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Farman Salmanov
Chief of Glavtyumengeoligiya

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be necessary to do almost three times as much oil development drilling in 1980 as in 1977.

All authorities agreed that it would be impossible to accomplish this objective with the number of oil drilling rigs and brigades that were in Tyumen at the beginning of 1978. According to one account, 180 drilling brigades were required to meet the five-year drilling plan, but as of January 1978 there were only 83 in Tyumen. Oil drilling requires highly skilled labor, and consequently the total number of drilling brigades available in the country cannot quickly be expanded. To meet Tyumen's needs it has been necessary to shift a significant number of brigades from other regions, which has inevitably exacerbated the problem of holding stable the level of extraction in older fields.

Table 2

Million Meters

Drilling Requirements for The Ministry of Oil, 1970-80

	West Siberia	Other	Total
1970	1.0	8.0	9.0
1971	1.2	8.0	9.2
1972	1.4	8.5	9.9
1973	1.8	8.7	10.5
1974	2.3	8.7	11.0
1975	2.8	8.9	11.7
1976	3.4	8.7	12.1
1977	3.8	9.0	12.8
1978	5.0	9.3	14.3
1979	7.5 est.	9.0	16.5
1980	10.0	9.3	19.3

In 1977 plans were drawn up to transfer drilling brigades from the Tatar, Bashkir, Kuibyshev, and Saratov fields to Tyumen, and some brigades were actually dispatched before the end of the year. These plans were accelerated following the December Plenum. According to a decision taken by the Ministry of Oil, the so-called tour of duty or expedition system was the model to be employed. Under this system, the brigades would remain under the jurisdiction of their former drilling administrations and would be flown to Tyumen for two-week tours and then flown back to their homes west of the Urals.

The first brigades were drawn from the Urals-Volga fields of Tatariya, Bashkiriya, Kuibyshev, and Saratov while later groups were to come from as far away as Stavropol', the Ukraine, and Belorussia. As of the end of June 1978, 21 of these new drilling brigades had been organized, out of a planned total for 1978—it would appear—of 25. In 1979 it is planned to create 35 additional drilling brigades in Tyumen. The "flying brigades" were assigned about 10 percent of Tyumen's oil drilling plan for 1978.

From the outset there were serious hitches in transportation, housing, and production arrangements for the new drilling brigades. Because of shortages and failure by suppliers to deliver sufficient additional drilling rigs, competition arose between the newcomers and



X1 One of the "flying brigades" arrives in Tyumen, having been transferred from oilfields elsewhere in the country

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drilling administrations subordinate to Glavtyumen-neftegaz—with the latter inevitably the winners. The new brigades are apparently in the unenviable position of being responsible for work that may really not count toward the official plan fulfillment of either Glavtyumenneftegaz or their base administrations. Not surprisingly, they are underfulfilling their quotas so far. [REDACTED]

X1 Similar problems have arisen in implementing the directives of the December Plenum in construction, transportation, and electric power supply, which for years have been chronic bottlenecks in Tyumen development. The crux of the difficulty in all three fields has been intense demand elsewhere for resources and manpower, and incentive structures that motivate the various construction and transportation ministries and the Ministry of Power and Electrification to hold back on activity in Tyumen. [REDACTED]

X1 Following Brezhnev's trip, and in response to much criticism, Gosplan issued a well-modulated promise to increase the capacity of construction organizations in Tyumen in 1979 and 1980. It followed this move by announcing in September a series of measures affecting construction, transportation, oil equipment, and scientific research in Tyumen. There were also pledges



Construction of housing, such as this project in West Siberia, is but one infrastructure problem accompanying Tyumen development

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by transportation ministries and the Ministry of Power and Electrification, extracted under heavy fire, to do better by Tyumen in the future. These moves have not quieted criticism from Tyumen, nor are they likely to do so. The campaign that Brezhnev has set in train cannot help but pry some resources loose from the ministries concerned, but it has not changed whatsoever the fundamental structure of their interests; and these interests will continue to be expressed in the planning process and policy implementation. [REDACTED]

25X1 The same observations apply with even greater force to the campaign unleashed with great fanfare in May 1978 to assign top priority to Tyumen deliveries from plants all over the USSR. This campaign has undoubtedly been getting some supplies to Tyumen faster than they would otherwise arrive. The prospects for its long-term success, however, are questionable. The campaign is carried along strictly by "moral incentives"; that is to say, it tends to run counter to the natural interests of each and every factory and ministry that

changes its established priorities in order to expedite deliveries to Tyumen. More important still, the effectiveness of the campaign is limited by the backward linkages to other sectors of the economy of goods required by Tyumen. For example, the possibility of supplying Tyumen with more and better drill pipe, pumps, compressors, large-diameter pipes, high-voltage transmission lines, and so on, quickly runs up against the allocation of metal within the economy as a whole and the capabilities of the metallurgical industry. There is very little slack available in the supply side of the economy, and once it has been taken up Tyumen growth will be directly constrained by the structural weaknesses of the Soviet economy as a whole. In fact, the imposition by fiat of unplanned changes in the scheduling of deliveries can only have unfortunate ripple effects elsewhere. [redacted]

A central issue in Tyumen oil development in the current five-year plan has been *where* to concentrate the extraction effort. The alternatives have been either to attempt to develop a larger number of new small fields, with all the problems this entails, or to attempt to meet the plan by developing fewer new small fields while increasing drilling and extraction above projected capacity at the older West Siberian fields—notably Samotlor. The price of the latter course of action is to reduce the ultimate recoverable yield from the older fields and produce a steeper rate of decline after the four years or so in which the fields are produced above maximum efficient rates. [redacted]

The late chief of Glavtyumenneftegaz, Viktor Muravlenko, who died in 1977, felt that the only rational course of action left by 1976 was to undertake immediate development of a large number of small new fields in Tyumen. Such a policy would maintain growth in oil production while preventing further damage to Samotlor. Thus we find that in January 1976, Muravlenko was calling for the development during the forthcoming 10th Five-Year Plan of 62 new deposits in West Siberia. Three months later, however, a local Tyumen official implied that the five-year plan target was only 36 new fields, and then Deputy Minister of Oil Mal'tsev stated that the target was "about" 30 [redacted]



Nikolay Mal'tsev
Minister of Oil

In 1976 it is asserted in Soviet sources, seven new fields were developed. According to the new head of Glavtyumenneftegaz, Arzhanov, in order for Tyumen to meet its plan for 1977, eight more new fields had to be developed, or a total of 15 for 1976-77. By the third quarter of 1977, however, slippage in the five-year plan target to 28 and then 25 new fields indicated that something was amiss. In December it was revealed that during 1977 work had "started" on only four new fields. Precisely how many new fields were actually in production by the end of 1977 is unclear. While Minister of Oil Mal'tsev appeared to claim that all four new fields were brought into operation, another source states that 10 new deposits were opened up in 1976-77, which would make the 1977 number only three (assuming that seven new fields *were* really brought into operation in 1976). In January 1978, David Shieler of *The New York Times* was told that "only 20 to 25" fields were being worked at this time in Tyumen. Since about 16 are said to have been in operation at the end of 1975, this would imply that at most nine new fields were brought into production in



Feliks Arzhanov
Current chief of Glavtyumennestegaz

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1976-77. All sources agree that the target for 1978 is eight new fields. Once again, though, the five-year plan goal has apparently been lowered: in April 1978 Arzhanov stated that the target was 23 new fields, which he reduced to 22 a month later. Later references mentioned 25 new fields. Assuming that 10 new fields were brought into production in 1976-77, and that eight will be introduced in 1978, only four to seven would be left for the remaining two years—an apparent anomaly that might be explained by difficulty of access to these fields.

The revision downward of the number of small fields being developed through 1980 has two implications. First, the halving of the small-field target in early 1976, a clear defeat for Muravlenko and like-minded proponents of *steady* Tyumen oil development, reflected the ascendance of the Combined Resources strategy at the time of the 25th Party Congress. Operationally, it implied a decision to limit investment in Tyumen, while meeting oil needs through more intensive exploitation of Samotlor in the 1976-80 period. Looked at charitably, this decision represented an attempt to buy time for developing alternative energy resources. A more realistic appraisal would probably be that it was designed to cut costs during 1976-80 regardless of the longer term consequences: it was another example of energy decisionmaking being driven by short-term expediency. Secondly, the serious shortfall in the opening up of new fields in 1977 and the further reduction of the five-year plan target to only 22 to 25 fields quickly revealed the lack of realism in the leadership's treatment of the small fields. As Muravlenko and others had been saying for a number of years, there was no cheap solution to further development of Tyumen. The leadership's about-face since December 1977 is a grudging acknowledgment that these people were right.

Stabilizing or slightly increasing the level of output at Samotlor through more drilling and some combination of more submersible pumps and gas lift is strategic in *maintaining* the overall level of Soviet oil production at the present juncture. But the cutting edge of any significant *growth* in oil production, the key to the future of the oil industry over the next 10 years (so Brezhnev in effect tells us), is development of the small fields. These fields, which generally lie farther away from the Ob waterway and established lines of communication, in the swamps of central Tyumen, pose acute problems of road building, electric power supply, and pipeline construction. The problems are magnified, and the costs multiplied, by the geographical isolation of individual fields (see the map, page 51). During 1978 a number of articles have dealt graphically with the difficulties presented by the small fields. These articles convey a clear impression that plans for developing the small fields will be met only



A drilling site in West Siberia

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with great difficulty and not on schedule.³⁷ Output at the few new fields developed to date, moreover, is said to average less than half of the planned initial volume.

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Urengoy Gas Development

According to Minister of Gas Orudzhev, restraint on investment in the gas industry was enforced in 1976-77. During the course of 1977 increasing attention was paid to Tyumen gas, including pipeline projects and the Urengoy field. Some work had already been proceeding on this field itself since 1974, and preliminary work on the Urengoy-Chelyabinsk pipeline right-of-way began in 1977. Nevertheless, a decision apparently taken around the time of the December 1977 Plenum called for an abrupt acceleration of the whole pace of development.

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Urengoy is the largest known natural gas and condensate deposit in the world, measuring 167 kilometers long and 35 kilometers wide. Its multilayered structure contains two main gas pools, with currently estimated reserves of over 5 trillion cubic meters—equal to total

³⁷ A good example is provided by an article in *Trud*, 11 April 1978. A typical new field, such as Povkhovsk, lies 200 kilometers away from Nizhnevartovsk (Samotlor) in a wasteland of taiga, lakes, and swamps. Here, as at other new fields, the "golden rule" of development that specifies that roads, electricity, and pipelines must run ahead of oil recovery, rather than along with it, much less lag behind it, was being violated. Povkhovsk was supposed to go into production in 1977, but did not; it would be lucky to operate in 1978. The only way to deliver freight to it was by a costly winter road or even more costly helicopter transport. Power was supplied by diesel engines. And a third of the pipeline designed to carry the oil out had not yet been built. To meet development requirements in the Nizhnevartovsk region, at least 216 kilometers of hard-surface roads should have been built in 1978. The assigned contractor's capacity, however, was barely 60 kilometers. In Tyumen as a whole, minimum estimates of required powerline construction in 1978 were at least twice the capacity of the powerline construction trust. The railway from Tyumen city to Surgut and Nizhnevartovsk, the "needle's eye," was so jammed that one ban after another prohibits trains carrying urgently needed freight from heading toward Tyumen. Vitally needed drilling rigs have been sitting for five months somewhere in Sverdlovsk Oblast. The article summed up:

There will be oil in the long run, there is no doubt of this. But the extreme tension with which it is now being extracted, especially at new fields, verging on a breakdown, is hardly justifiable. Experience—our own, unborrowed, tested experience—has taught us the strategy and tactics of development. So why do we start over each time, forgetting that reliable and faithful keys to the mineral riches of Tyumen have been found long ago?

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US gas reserves less those in Alaska. The decision to move ahead rapidly on Urengoy entailed an increase in the tempo of drilling and field preparation, aiming at production of 58 billion cubic meters per year in 1980—that is, development to almost the level achieved at Medvezh'ye over a six-year period. In a single year, 1978, a large-diameter pipeline was to be laid between the Vyngapur field south of Urengoy and Chelyabinsk, and gas from Vyngapur was to reach Chelyabinsk in the third quarter of 1978. This has in fact been accomplished. (The normal time allowed for construction of such a pipeline is said to be three years.) In 1979 the connecting link from Urengoy to Vyngapur is to be added, completing the first line of the Urengoy-Chelyabinsk trunk system, which will subsequently be extended to the Volga region. In the meantime, a line connecting Urengoy with Nadym was to be built in 1978, allowing some Urengoy gas to be immediately transported west through the Northern Lights and Urengoy-Center systems. [redacted]

The suddenness of the decision, and perhaps controversy over its adoption, was suggested by the way it was made public. At the December 1977 meeting of the Supreme Soviet, Baybakov failed even to mention Urengoy, but by February 1978 it was being called one of the "largest construction sites of the five-year plan." The first public glimpse of the decision appears to have been offered by Shcherbina, who stated in an interview at the end of December 1977:

The Urengoy gas deposit has become a main construction site, which in its scale much exceeds the famous Samotlor. The schedule is extremely tight. Never before has the task been set of building in a single year a pipeline of 1,421 millimeters stretching 1,500 kilometers—from Urengoy to Chelyabinsk. [redacted]

In his letter of congratulations in early January to Nadymgazprom, the branch of the Tyumen Gas Administration responsible for Medvezh'ye and Urengoy, Brezhnev provided what appears to be the most authoritative public reference so far to the Urengoy decision by observing elliptically at the end of his greetings:

The Central Committee of the CPSU notes with satisfaction that you are constantly striving to multiply results achieved and already in the next few years intend to solve one of the most important links—to master the unique Urengoy gas deposit.

A decision of the magnitude involved here would have to be made at a level not much below the Politburo. By presenting the Urengoy acceleration as a matter of local initiative, Brezhnev was deliberately skirting the question of authorization of this move. In contrast, the Tyumen obkom first secretary, Bogomyakov, soon after identified Brezhnev himself as the source of initiative, alluding to "the mission set by comrade L. I. Brezhnev to master in an accelerated fashion the unique Urengoy deposit." [redacted]

Other evidence confirms the abruptness of the policy shift on Urengoy. Completion of the Surgut-Urengoy railway was pushed ahead to 1979, rather than 1980. (This schedule will probably not be met.) The head of the Urengoy Gas Construction Administration stated in May 1979 that "literally in several months the tempos of construction grew five times." Transportation planners in Tyumen were taken off guard. There also appeared to be more than the usual degree of disorganization in implementation of the decision. [redacted]

The immediate reason for the sudden concentration on Urengoy is indicated by the crash construction of the Urengoy-Chelyabinsk pipeline: namely, an energy shortage in the Urals heavy industrial region. Despite years of talk, the "Southway" route had never been developed. As *Pravda* observed, this was "a completely new outlet direction for Soviet gas. The trunkline will link the Tyumen North with the industrial Urals by the shortest route." And *Izvestiya* circumspectly noted that there were "growing demands for [Tyumen gas] in the industry of the southern Urals." [redacted]



Gennadiy Bogomyakov
Tyumen obkom first secretary

The longer term Urengoy development plans are unclear to the outside observer, and probably have been unclear to the Soviets themselves. Even after December 1977 there appears to have been considerable indecision about when and where pipelines would be built. Although there had earlier been talk in a general way of multiple pipelines along the Urengoy-Chelyabinsk route, only in mid-1978 was it announced that a decision had been taken to build a second Urengoy-Chelyabinsk line by the fourth quarter of 1978 and a third line before the end of 1980. After that, there was no clear policy:

There exist other proposals regarding directions for the transport of Urengoy gas. The Ministry of Gas, the Ministry of Construction of Petroleum and Gas Industry Enterprises, and other interested organizations must quickly complete their study of this problem so as to lay down a precise work program for the long-range construction of gas pipelines.

Repeated statements have been made indicating that no comprehensive program exists for the present crash development of Urengoy. The same source just quoted observes that "scientists and planners *are now studying* the question of a sharp increase in the size of Urengoy" (emphasis added). In a speech delivered in May, the chief of Glavtyumengeologiya, Salmanov, concentrated on "the important problem of framing scientifically based programs both for the region as a whole and for the individual most important objects of the complex. Urengoy, in particular, begs for such program." And a highly critical description of what is now going on in Urengoy also published in May revealed that relentless pressure from above for immediate output in 1978 was compelling administrators on the site against their better judgment to repeat all the worst mistakes committed in the development of Medvezh'ye:

But here they are, having begun a new and enormous job, forced to put it in the old rut. Already this year there must be the first billions of cubic meters of Urengoy gas—but neither roads, nor normal housing, nor an industrial base: everything slipshod, all superfast, as if there were no time to calculate, to reflect and, finally, to infuse development with all the laws of the end of the seventies of the twentieth century.

Not only is there no program for the immediate future, there also appears to be no agreed policy for the longer term. Serious reservations were evidently entertained in late 1977 about the enormous costs of gas development in north Tyumen. The chief of the Tyumen Gas Administration, Altunin, has indicated that this attitude could be found in "planning organs, ministries, and departments." Although Minister of Gas Orudzhev made a ritual declaration in February 1978 that the Ministry of Gas "wholly and fully approved the decisions of the December [1977] Plenum of the Central Committee and has accepted them for unswerving execution," and also acknowledged the key future role of Tyumen gas, he probably did so to indicate public acceptance of a policy with which he had privately disagreed. In October 1977 he had

X1 supported adoption of a special conservation law that would have cut back on the rate of gas development; in March 1978 he spoke privately of the possibility of Soviet gas production peaking in the 1980s; and in June he restated in *Pravda* his familiar argument on the need to save gas. [redacted]

X1 Meanwhile, old advocates of the Big Gas strategy were once again presenting their case. The situation, of course, had changed. Urengoy development of 1978 was in no way equivalent to the "Big System" considered in the 1972-75 period; the capacity of the Urengoy-Chelyabinsk line was only 30 billion cubic meters per year, not 300 billion. Nevertheless, as additional lines are added there could be a convergence in practice with what had earlier been proposed. [redacted]

X1 The most comprehensive statement of the Big Gas argument appeared early in 1978 in an interview given by Shcherbina. Shcherbina admitted that the costs of north Tyumen gas development were huge, but asserted that there was no other choice.

X1 In the 10th Five-Year Plan the entire growth of oil and 40 percent of the growth of gas of the country will come from West Siberia. This situation, as is evident, *will not change in the foreseeable future*. Now it is already perfectly clear that in the longer term *many hundreds* of billions of cubic meters of gas can be extracted per year. Reserves will permit organizing extraction for a long period *with sufficient reliability*. (Emphasis added) [redacted]

X1 Shcherbina maintained that in the immediate present there was no alternative to building large-diameter trunklines, each capable of carrying 30 billion cubic meters per year: "We urgently need them. There's no other way without them." The time factor was important here. Only a year or two was needed to build a single 1,420-millimeter diameter pipeline sufficient to fuel 17-19 million kilowatts of generating capacity, or "more than the total capacity of all the hydroelectric stations now operating on the Enisei and the Angara." [redacted]

However, the extraction of gas would increase so rapidly in the next few years that present large-diameter pipes would no longer be able to cope with the task. To meet the demand for Tyumen gas:

It will be necessary to build two or three dozen superlong-distance lines. Their construction will demand many tens of millions of tons of steel and colossal simultaneous capital expenditures. This is unreal. It is necessary to seek another path for solving the transport problem.

According to Shcherbina, the key was "unorthodox ideas, the capacity to think originally, to fantasize, and to organize the embodiment of these ideas and fantasies in concrete actions." [redacted]

The way out of the dilemma, Shcherbina argued, involved two parallel courses of action. The first was adoption of the idea the "Tyumentsy" had proposed back in 1968-69: building huge gas-fired power plants to generate electricity, which could then be transmitted beyond Tyumen by high-voltage lines.³⁸ This system of power stations, with a now-projected capacity of 60,000 to 70,000 megawatts (equivalent to 15 to 17 Bratsk hydroelectric stations), could start with the Surgut and Tobol'sk power stations and a third station of 7,000 to 8,000 megawatts that should be built in the region of Sergino. The power plants would burn natural gas and associated gas that was now being flared. The second course of action was to shift in the "near future" to transportation of chilled gas through the "practically indestructible" Paton multiwalled pipes, which would more than double the carrying capacity of a large-diameter pipeline. This intermediate step would be followed by transportation of liquefied gas, "a very complex business" that would nevertheless permit a sixfold increase in pipeline capacity. [redacted]

³⁸ In Shcherbina's words:

Approximately in 1968-69 the Tyumentsy proposed beginning construction in the north of thermal electric stations based on local natural gas with a total capacity of 20-30 million kilowatts. The idea, unusual to many, was rejected on the basis of economic calculations: the cost of the electric stations and high-voltage lines was higher than that of a pipeline. These objections, let us state directly, bore a scholastic character. However, the draft was not supported. [redacted]

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In addition, Shcherbina strongly endorsed a change in policy that would effect a much more rapid development of refineries and the petrochemical industry in West Siberia, construction of product pipelines to the European USSR, and expansion of a variety of energy-intensive, bulk-output chemical industries. "To be sure," he observed, "all of this demands the solution of a broad range of tasks—technical, economic, and social, and the efforts of many ministries and departments. Naturally, not a little time will be spent on this. But nevertheless we have to deal with these problems." Shcherbina obviously saw himself as the leader capable of implementing this vast scheme. []

During 1978 some or all of Shcherbina's ideas have also been put forward by other authorities, most of them long-identified with the Big Gas position. Both Nekrasov of Gosplan's SOPS and Bogomyakov have pushed for the construction of massive gas-burning power plants in Tyumen. Academician Aganbegyan has privately endorsed accelerated gas development because of limited oil reserves and has dwelt on the need to introduce chilled gas transmission, perhaps within five years. Bogomyakov's subordinate in the Tyumen obkom, Shmal', has echoed the earlier Big Gas vision of a production level in Tyumen of 300-350 billion cubic meters per year. According to Shmal', Urengoy will take the torch from Samotlor and become the main source of energy supply in the years 1980-95. These are all, of course, simply personal opinions. But the very fact that they are being expressed demonstrates the open horizon of energy policy. Especially relevant here is the power plant proposal, which has major negative implications for investment in Kansk-Achinsk coal development. []

Combined Resources

Combined Resources positions have continued to be aired since December 1977, but without great vigor. The difficulties of meeting current production and development targets in both coal and nuclear power may have dampened enthusiasm; and the climate is less receptive to longer term strategies of dealing with the energy problem than it was in 1976. The case for

Kansk-Achinsk does continue to be expressed. As noted above, Yatrov, the director of Gosplan's Institute for Complex Fuel-Energy Problems, stressed Kansk-Achinsk in his defense of the Combined Resources line at the end of March 1978, and Kosygin lent his support to the project in major speeches in May and November. There have also been articles in the press on Kansk-Achinsk. However, actual development of Kansk-Achinsk, in particular work on the Berezovo field, is progressing very slowly, and Minister of Coal Bratchenko has not indicated any expectation of a sudden improvement in the situation. []

In 1978 there continues to be major uncertainty about how Kansk-Achinsk coal will ultimately be used. The need for Kansk-Achinsk energy in Siberia alone appears to be acute. A scientist wrote in the 3 September 1978 issue of *Sotsialisticheskaya industriya*:

Calculations have shown that the rate of development of Siberia is such that it is necessary every two years to put into operation such a power engineering giant as the Krasnoyarsk Hydroelectric Station. And it will be necessary to do this every year during the next five-year plan! But it is clear that it is impossible to put into operation [this frequently] a hydroelectric station of the size of Krasnoyarsk. The only way out is to burn Kansk-Achinsk coal, which is most accessible and economically very profitable.

To help meet this demand, construction was scheduled to begin in 1978 on the first energy block of Berezovo station in the Kansk-Achinsk region. This first giant Siberian thermal power station, with a projected capacity of 6,400 megawatts, will be the largest of its kind in the world. However, severe residue problems arising from the combustion of Kansk-Achinsk coal in power station boilers have still not been solved, nor have suitable boilers yet been produced, which will inhibit the use of the coal even for regional electricity generation. []

Furthermore, as noted above, construction of the 2,200- to 2,400-kV DC long-distance powerline required to transmit electrical energy from Kansk-Achinsk to the Center depends upon prior successful experience with the 1,500-kV DC Ekibastuz-Center line. Construction of that line was scheduled to begin in 1978, although this starting date may not have been met. According to the head of the construction administration building the line, the work will be done in four sections: the first will be completed in 1984, and the last three by 1987. At this rate it is highly unlikely that construction of the Kansk-Achinsk - Center line could get under way during the 12th Five-Year Plan (1986-90) even if the technical problems proved soluble. It is probable that the leadtimes on slurry transport, pyrolysis or coal liquefaction are at least as long if not longer. [redacted]

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The openness of coal policy was indicated most graphically, perhaps, in a 25 August 1978 *Pravda* article. The article questioned the accepted wisdom that Kuzbass coal was mainly for coking purposes and that it could not compete in cost terms with Kansk-Achinsk coal as a boiler fuel. While Kansk-Achinsk coal was certainly cheaper when burned at power plants in Siberia and converted into electrical energy, there was a growing shortage of hard fuel as well as electrical power in the European USSR. To meet this need, two-thirds of Kuzbass coal could be used for noncoking purposes. A special railway could be built from the Kuzbass through the southern Urals to the Volga region to carry this coal. Alternatively, a slurry pipeline could be built. Kansk-Achinsk coal would then be used strictly as a fuel for thermal power stations, both in the Kuzbass and central Siberia, providing the basis for an expanded development in these regions of energy-intensive industry. In contrast to the views of some top energy policy advisers such as Kirillin or Mel'nikov, who probably had considerable influence on the line approved by the 25th Party Congress and expressed in the 10th Five-Year Plan, Kansk-Achinsk was assigned no role at all as a direct supplier of fuel or electrical energy to the European USSR. The point, again, as in the case of the gas-fired power station proposal, is that such a fundamental issue could hardly be raised if there existed a firm official position on where energy production policy was going. [redacted]

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V. Prospects

The change of direction on energy policy that occurred at the December 1977 Plenum of the Central Committee and the subsequent campaign to accelerate oil development in Tyumen signal the extreme difficulty the Soviets are having in sustaining a balanced response to long-term energy development needs and short-term demands for petroleum. Since 1976 there has been a definite foreshortening of the energy horizon. At the moment, the Soviets are fighting to maintain West Siberian oil output by increasing drilling and recovery efforts at Samotlor and other older Tyumen deposits, and to raise the level of output by opening up smaller Tyumen fields. [redacted]

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At the outset of the current five-year plan the leadership apparently opted to develop fewer small fields in Tyumen and to compensate for this by more intensive exploitation of Samotlor, despite the greater field damage and steeper ultimate dropoff in production this would entail. Clearly, the leadership already in 1976 felt compelled to sacrifice the longer run goal of a relative stabilization of Samotlor production, either in order to buy time or simply to get the oil without having to pay increased costs associated with more rapid small field development. Soviet officials made the decision with full knowledge that no new giant oilfield to replace Samotlor had been discovered—much less developed. The consequences of this short-run approach to Tyumen oil production were intensified by failure in 1977 to develop even the planned number of new fields. Payment for this trade-off will come due in the 11th Five-Year Plan (1981-85), when greater investment will have to be made both in developing more new fields than might otherwise have been necessary, and in providing gas lift and other recovery equipment for Samotlor. [redacted]

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Meanwhile, the inability of the Soviet leadership over the past decade to force a technological breakthrough in even one type of east-west energy transportation seriously jeopardizes any possibility of large-scale substitution of gas or coal for oil in the 1980s. [redacted]

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The race against time now under way to develop and transport Urengoy gas by conventional pipelines will probably not have a large impact on the overall fuel-energy balance, although it may significantly affect the local energy balance in the Urals. Whether Soviet R&D organizations will be able to solve the problems of chilled or liquefied gas transportation in time to have an effect in the coming decade is highly problematic. It may well be that the Soviets have already delayed too long for gas to play the role it otherwise might have in bridging the gap between the present and the anticipated era of abundant nuclear energy.

[REDACTED]

Similar conclusions are in order with respect to Kansk-Achinsk coal. Delays in mine construction, in solving the high-voltage DC transmission problem, in developing either slurry or capsule pipelines, in implementing any one of the coal processing techniques, and in producing power-generating equipment adapted to Kansk-Achinsk coal now push a possible "coal alternative" well off into the 1990s.

[REDACTED]

These delays are probably now being seriously exacerbated by the Tyumen oil campaign.

[REDACTED]

[REDACTED]

Tyumen until the mid- or late 1980s instead of early in the decade. Although this complaint reflects the views and interests of the Tyumen gas administration, its substance may well be correct.

[REDACTED]

Despite the grave problem that confronts the Soviets in energy production, there has been almost a decade of policy vacillation and indecision. From a faith that the share of oil and gas in the energy balance would continue to rise, Soviet authorities moved in the early 1970s to the hope that a big leap in gas production alone might prove to be the answer; by 1975-76 a broadly based strategy keyed to oil and gas in the present, coal in the middle term, and nuclear power in the longer term was approved as the party line; and by late 1977, policy had shifted to embrace a campaign that put the main emphasis on development of oil and gas production over the next decade. However, the adoption of the most recent line has not stilled the

expression of conflicting opinions. It is highly likely that some top officials, including Premier Kosygin and Gosplan Chairman Baybakov, would prefer a policy formula that provided more scope for coal and nuclear power. And other authorities, with a Tyumen orientation, are clearly attempting to have an even greater role assigned to natural gas.

[REDACTED]

Given this fluidity in the party line, it is not surprising that there has never existed what could properly be called a comprehensive and *operative* energy program. To be sure, there are various studies and recommendations; there are many R&D projects; and there are compilations of one-year and five-year plan targets, which may partly be influenced by an image of a distant desired energy balance. Such images unquestionably do exist in the minds of top Soviet economic policymakers and energy advisers. But the evidence strongly indicates that the *process* of energy production decisionmaking has not been seriously influenced by any carefully elaborated and stable master scheme. Instead, the system is driven by immediate supply needs and input constraints.

[REDACTED]

Typically, there seems to be a cycle in which studies and recommendations precede a policy shift; the policy shift generates efforts to formulate an integrated program; but this program formulation is quickly overtaken by changing demands that evoke counterrecommendations and a switch once again in the policy line. The absence of an operative master energy program is matched by the absence of operative, long-term, integrated programs for key energy production sectors. Repeated complaints by local authorities suggest there have been no such programs for oil development in Tyumen, for development of Urengoy gas, or for development of Kansk-Achinsk. Nor has there been an effective program for offshore oil, although creation of the new Main Administration for Exploration and Development of Offshore Oil and Gas Fields in August 1978 may have improved matters here. When we ponder what "the Soviets" intend to do five or 10 years from now in some area of energy production, we may overestimate both the extent to which an intention has firmly crystallized and the extent to which an intention, even if formulated, affects current decisions.

[REDACTED]

X1 The effective absence of program-determined decisionmaking is to some extent a product of the inherently greater—and probably still increasing—degree of uncertainty characteristic of the energy sector compared with other branches of the economy. Information about reserves is subject to change and is imprecise at best. Long leadtimes are a feature of development in all energy branches. And the cost, time framework, and feasibility of technological innovation in such areas as deep drilling, offshore exploration and extraction, gas transportation, coal treatment, and high-voltage electrical transmission are opened.

Equally important, though, has been the impossibility of isolating the energy sector, despite its high priority, from all the general problems that afflict the Soviet economy. In the absence of a serious economic reform, the inevitable disjunction between goals and “success indicators” produces the same short-term perspective, anti-innovative bias, and irrational behavior in energy found elsewhere in the economy. This is a factor that should not be underestimated. Development in the energy sector is also immediately linked with success or failure in many other key sectors of the economy, including metallurgy, machine building, chemicals, construction, and transportation, where persistent bottlenecks have likewise arisen from systemic features of the economy. In other words, the complex linkages between the energy and other sectors of the economy significantly reduce the capacity of the leadership to achieve any rapid improvement across a broad front in energy through the application of traditional techniques of political mobilization.

X1 The absence of effective programs is a direct consequence, too, of the complexity of the issues involved and the division of opinion among specialists as to how they should be solved. Top policymakers are especially dependent on the advice of specialists in the energy field; it is an area in which few of them have had experience and in which intuition or common sense cannot take one very far. Yet, as we have seen, the specialists, guided by personal aims and vested institutional interests, tender conflicting advice.

At the juncture between policymakers and advisers there appears to be no single point at which conflicting advice is analyzed and firm choices made: the Presidium of the Council of Ministers, Gosplan, and the Secretariat are each involved. This pattern reflects the division of labor and balance of power at the top of the Soviet system. Divided opinions among both the leadership and energy authorities, combined with the fragmented structure of power and preference for a consensual style of decisionmaking, have usually encouraged compromise policy outcomes determined by the lowest common denominator—although the December Plenum of 1977 does reveal a capacity to effect sudden shifts in policy if the situation is deemed sufficiently grave. On the whole, despite increasing anxiety over the energy problem since the early 1970s, the system in which policymakers operate has dampened and delayed a decisive response to the problem, while stimulating the de facto pursuit of short-term aims.

Without a significant increase in the share of investment going to energy production and related branches of the economy (for example, steel), it is difficult to see how the Soviets can do much to remedy the dilemma that now confronts them. In this respect, they have less freedom of maneuver today than they had in the early-to-mid-1970s. They must make an increasingly heavy commitment of resources to oil production in Tyumen because they must have the oil; without the allocation of additional investment to the energy sector as a whole, progress toward either a gas- or coal-based solution to the energy problem will be retarded; and delay in developing these alternatives will generate still more pressure to maintain the existing proportion of oil in the energy balance—despite the day of reckoning that must come unless a new supergiant oil region is quickly discovered. Brezhnev’s speech at the November 1978 Plenum of the Central Committee suggests that energy-related investment may indeed be given a higher priority during the remaining years of the present five-year plan. Because the physical resource demands of energy production fall heavily upon the heavy industrial, construction, and transportation sectors, pressures may mount to make compensatory cutbacks not only in the buffer sectors of agriculture, housing, and light industry, but in military production as well.

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As the Soviets struggle with this problem, grudgingly increasing the share of investment in energy, they are likely to try to revive what we have called the Big Gas strategy. Provided the extent of gas reserves is anything like official claims, a quantum leap in the use of Tyumen natural gas would be the only way a really rapid increase in fuel production could be brought about. This approach, however, would place an acute strain on the steel industry and gas and oil machine building. Foreign supply of credits, large-diameter pipes, and compressors might well prove to be even more critical at that juncture than at present. []

The Combined Resources strategy propounded by Kosygin and Baybakov at the outset of the current five-year plan, with its stress on nuclear power, coal, and hydroelectricity, was presented in almost so many words as the Soviet "Project Independence." The retreat from this strategy in December 1977, midstream in the plan period, may have compromised the objective of avoiding external structural vulnerability in energy matters. By playing down the policy commitment to coal and nuclear power, perhaps to avoid cuts in military or agricultural spending, Brezhnev has implicitly increased the already urgent Soviet need for a broad range of Western onshore and offshore oil and gas technology. A decision to shift in the direction of a Big Gas strategy, as noted above, might well accentuate this potential technological dependence. []

More important, any slackening in the expansion of coal production and nuclear generating capacity that might arise as a byproduct of the current strategy threatens to leave the Soviet Union in the latter 1980s and in the 1990s with an extremely tight energy situation, if not a serious energy deficit. It is apparently this forbidding prospect of a deficit, not the question of dependence on Western technology acquisition, that has most disturbed Kosygin. If the present strategy continues to be pursued, and development of coal and nuclear power is not accelerated, Soviet energy independence will hinge even more than now on either the chance factor of major new oil discoveries, or a big leap in gas production and transportation; without one or the other, faster exploitation of current oil reserves will simply hasten an energy crisis of drastic proportions, with all the attendant problems for Soviet foreign policy. []

It would not be unreasonable to suppose that the Soviet leadership might search for an organizational solution to its energy production dilemmas; this has been a typical response to analogous problems in the past. As we have seen, it appears that neither the Politburo nor the Secretariat has to date provided the kind of supervision and day-to-day control over energy production of which it is capable. We might expect to see the formation of a Politburo-level committee responsible for monitoring energy problems, which would bring together an upper stratum composed of Politburo members (for example, the General Secretary, the senior secretary for economic affairs, and the Chairman of the Council of Ministers) and a lower stratum composed of key administrators (perhaps the Central Committee secretary responsible for heavy industry, the deputy chairman of the Council of Ministers for energy, the deputy chairman for fuel-energy affairs, the deputy chairman for science, and the chairman of Gosplan). Conceivably such a grouping might come together as a committee or subcommittee of a committee with a mandate extending beyond energy questions. A more visible change that might be anticipated would be the appointment of a Central Committee secretary responsible solely for energy affairs. []

Neither change would significantly alter the present situation. There would still be the same conflicting claims of the different energy branches and the same hard choice between the claims of energy and other sectors of the economy. There would still be divided opinion on which course to follow. And there would still be a diffusion of power and responsibility at the top. Although the appointment of an energy secretary would swing initiative toward the Secretariat, it would not produce an "energy tsar" unless the jurisdiction of such a post was extended to all the sectors of the economy that support energy. Such an innovation would mean a radical restructuring of the entire present system of top-level economic administration, and probably could be pushed through only under a leader even stronger than Brezhnev. []

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The coming leadership succession is unlikely to thrust such an individual forward, at least for a number of years. A succession period probably will permit an easier reconsideration of the present policy than would be possible if Brezhnev were still around, because of Brezhnev's strong public association with it. The possibility of a shift in the line during the succession cannot be discounted, especially if the "Tyumen acceleration" founders. A sharp change of direction was initiated in agriculture, industrial organization, and party management soon after Khrushchev's departure, before the power struggle had been settled. Where an earlier policy has clearly failed, there is no necessary paralysis in a succession setting. A speedup in gas production, for example, might well occur. However, there will probably *not* be a consensus supporting a particular solution to the energy production problem. The likelihood is that succession conditions will simply reinforce the present tendency toward compromise policy solutions and short-term expediency.

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Appendix

Alternative Strategies for Dealing With the Energy Problem

The Hydrocarbon Alternative

Strategy

One answer to the energy problem—the answer currently in vogue—is to maintain the policy pursued since the 1950s of priority development of hydrocarbons: simply accelerate the output of oil and gas. This solution, in effect, calls for a concentration of resources on Tyumen Oblast where most of the presently explored large reserves of oil and gas are located, although it also points to an intensification of petroleum and gas exploration and development farther east in Siberia. As an element of this strategy, it is urged that Tyumen be developed as a truly integrated “territorial production complex,” with the optimal balance of complementary industry and adequate provision of infrastructure wherever necessary in this enormous swampy, permafrost-ridden region. There should be maximum exploitation of all of Tyumen’s hydrocarbon resources through a large-scale buildup in Tyumen of the refining, petrochemical, and chemical industries. [redacted]

Proponents and Opponents

Most of the main proponents of this strategy, not surprisingly, are people who have played a personal role in developing Tyumen Oblast, which is not to say, of course, that all people who have been active in this region support the strategy. Boris Shcherbina, Minister of Construction of Petroleum and Gas Industry Enterprises since 1973, is the most prominent visible Tyumen booster. As party first secretary in Tyumen during the transformation of West Siberia into the Soviet Union’s most important oil- and gas-producing region in the second half of the 1960s and early 1970s, Shcherbina lobbied vigorously for a broad pattern of Tyumen development, and he has continued to do so in his present job. He has been joined by his protege and successor as obkom first secretary, Gennadiy Bogomyakov, a native West Siberian, and by a younger client, the present obkom second secretary

and former Tyumen Komsomol official, Gennadiy Shmal’. The most outspoken champion of the Tyumen cause is still another client of Shcherbina: the hot-tempered Azerbaidzhani, who discovered many of the big deposits in Tyumen and who is at present head of the Tyumen Geological Administration, Farman Salmanov. [redacted]

Apart from the Tyumen grouping, the most vocal supporter of Tyumen and East Siberian oil and gas development has been Academician Andrey Trofimuk, director of the Institute of Geology and Geophysics of the Siberian Division of the Academy of Sciences and member of the Presidium of the all-union Academy of Sciences. Other Tyumen supporters have included the chairman of Gosplan’s Council for the Study of Production Forces, Nikolay Nekrasov, and Russian nationalist circles associated with the literary journal *Oktjabr*.¹ Almost certainly the Hydrocarbon alternative represented by Tyumen development has also found some support over the years in the Central Committee apparatus, although we have no evidence precisely where. The most likely candidates are Dolgikh and perhaps Kirilenko, although Brezhnev himself may well have had some interest in the matter before espousing the cause in December 1977.² [redacted]

Two points should be noted about the supporters of the Hydrocarbon alternative. First, with the exception of members of the Secretariat, whose backing prior to December 1977 is largely a matter of conjecture, the pro-Tyumen forces have been mostly provincial in their geographical base and limited to the exertion of influence rather than operational command in promoting Tyumen development. Secondly, like the supporters of other alternatives, their position has to no small

[redacted]



Gosplan Chairman Baybakov (dark glasses) and the late Minister of Oil Shashin inspect a Tyumen oilfield

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extent tended to be directly related to immediate personal interests. For example, Shcherbina's ambition to become the deputy chairman of the Council of Ministers responsible for fuel-energy affairs turns in part upon making a record for himself in construction work and pipeline-laying in Tyumen; Bogomyakov and Shmal' have a direct stake in getting more investment and resources for their oblast; Salmanov's sense of personal identity is clearly linked to further oil and gas discoveries in Tyumen; and Trofimuk's professional standing rests on proving that Siberia does indeed have the oil and gas resources he has long claimed it has. These personal career interests should not be confused with regional loyalty, although an element of this too is certainly present. [redacted]

Opponents of the West Siberian Hydrocarbon alternative have always been harder to identify than proponents, but there is no doubt they have existed. The main source of resistance to a root-and-branch commitment of resources to Tyumen appears to have been Gosplan Chairman Baybakov and elements within Gosplan who have taken their cue from him.³ Baybakov is well aware that Tyumen is critical for Soviet energy development; he has probably spent more time thinking about this than any other top Soviet leader and has actively sought ways to harness Tyumen resources. The issue for him has almost certainly been one of degree; a matter of balancing Tyumen investment against other claims on resources. Basically, Baybakov has been concerned about the staggering costs of Tyumen energy development and transportation because it is he who has had to find the funds to meet Tyumen's needs and who has had to take much of the heat for cutting back other programs. [redacted]

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Valentin Shashin
Minister of Oil until his death in 1977

Baybakov's counsel on energy production policy is probably carefully heeded within top leadership circles. He is said to be on good terms with at least Kosygin, Mazurov (now retired), and Dolgikh, and to have played an instrumental role in aiding Brezhnev's rise to power. He also has close working relationships with the Academy of Sciences and the State Committee for Science and Technology, including strong influence with Mel'nikov, at least a cooperative tie with Styrikovich and Aleksandrov, and a collaborative relationship with Paton. Having personally worked in and headed the Soviet oil industry for many years, and then having dealt with the details of all energy production branches as Chairman of Gosplan, Baybakov can legitimately claim great familiarity with energy policy issues. He is also one of the few individuals who tells the Politburo what the tradeoffs are in investment decisions.

Premier Kosygin's attitude toward the Hydrocarbon alternative has probably also been one of reserve. What evidence there is suggests that his main concerns have been to effect a substitution of coal or gas for oil, stimulate nuclear power, hold down hard currency imports (he has specifically complained about the cost of large-diameter pipe) and in general raise efficiency and lower costs in energy production. He has not been "against" West Siberia; rather, he appears to have been interested in moving in new directions in order to reduce the dependence on oil.

The late Minister of Oil Valentin Shashin, who died in 1977, was probably another doubter of the Tyumen-based Hydrocarbon solution to the energy problem. Shashin's position appears to have been that oil was a precious nonrenewable resource that should be preserved as much as possible for future generations and that this circumstance ought to be reflected in the energy balance, the pricing of oil, and export policy. Back in 1969 Shashin stated at a press conference that Soviet oil exports would not increase significantly due to domestic requirements, and he reiterated this stand in 1974. Shashin's preferred go-slow oil policy was probably sincere, but it also reflected the interest of Shashin and his ministry in having realistic production targets for a region that presented them with a host of extremely difficult problems.

Disagreement in principle with the Hydrocarbon solution has probably been expressed most forcefully in scientific circles that question the reserve base of West Siberia—a topic treated below. Other energy-producing regions whose interests may be affected by the allocation of investment funds and scarce resources to Tyumen have constantly tried to defend themselves by arguing how high the returns are on investment in their particular region, although they rarely complain about Tyumen in public. There are also ministries whose capacity to fulfill plans and meet obligations elsewhere in the country are endangered by the voracious requirements of Tyumen, and who are thus probably not enthusiastic about overly ambitious plans for the region (for example, in the fields of electric power, construction, and transportation).

Issues

Tyumen may be the "discovery of the century," as the Soviet slogan claims, but its development has presented enormous problems and gives rise to a number of fundamental issues. The most crucial issue at present is how much oil is left in the region. This is not a new issue; at every stage of Tyumen's development there have been skeptics who have questioned the size of the region's oil resources, and this is equally true today.⁴ [redacted]

Since the consolidation of the giant oil-producing region on the Middle Ob in the second half of the 1960s, the key issue has become whether the rapid rate of increase in oil output achieved during 1971-75 can be sustained—and this depends on how much oil can be extracted from new small deposits already discovered—and whether there will be future discoveries of huge new oilfields of the magnitude of Samotlor. Those who have taken a very bullish stance on this question over a number of years include Minister of Construction of Petroleum and Gas Industry Enterprises Shcherbina; Tyumen first secretary, Bogomyakov; Tyumen chief geologist, Salmanov; Academician Trofimuk; and a number of other party officials and geologists. Some foresaw Tyumen oil production at 1 billion tons a year. Their argument has been that giant deposits can and unquestionably *will* be found at deeper levels in the Middle Ob region already being exploited, and—especially—beneath the huge gas deposits of northern Tyumen, as well as still farther north on the Yamal Peninsula and beneath the Kara Sea (see map). The faith that oil will be found in these areas is based partly upon controversial geological theories and partly upon discoveries in northern Tyumen of what some say are traces of oil, but others say are simply findings of gas condensate.⁵ [redacted]

In 1976 the debate over whether large reserves of oil exist in Tyumen sharpened, as belated decisions had to be made on the 10th Five-Year Plan (1976-80). In a polemical article published by *Pravda* on 19 February 1976, Salmanov argumentatively asserted that authoritative calculations showed that "there *are* possibilities in this region for the reliable and mighty

development of the oil and gas industry." (Emphasis added) However:

"Pessimists" have appeared whose thoughts amount to the proposition that the Tyumen geologists have already discovered everything that could be discovered. Such judgments are thoroughly false. To adopt this point of view means to disorient the planning organs. With all responsibility I must observe that the Tyumen geologists are firmly convinced of the reliability of the evaluation of resources of oil and gas in our region.

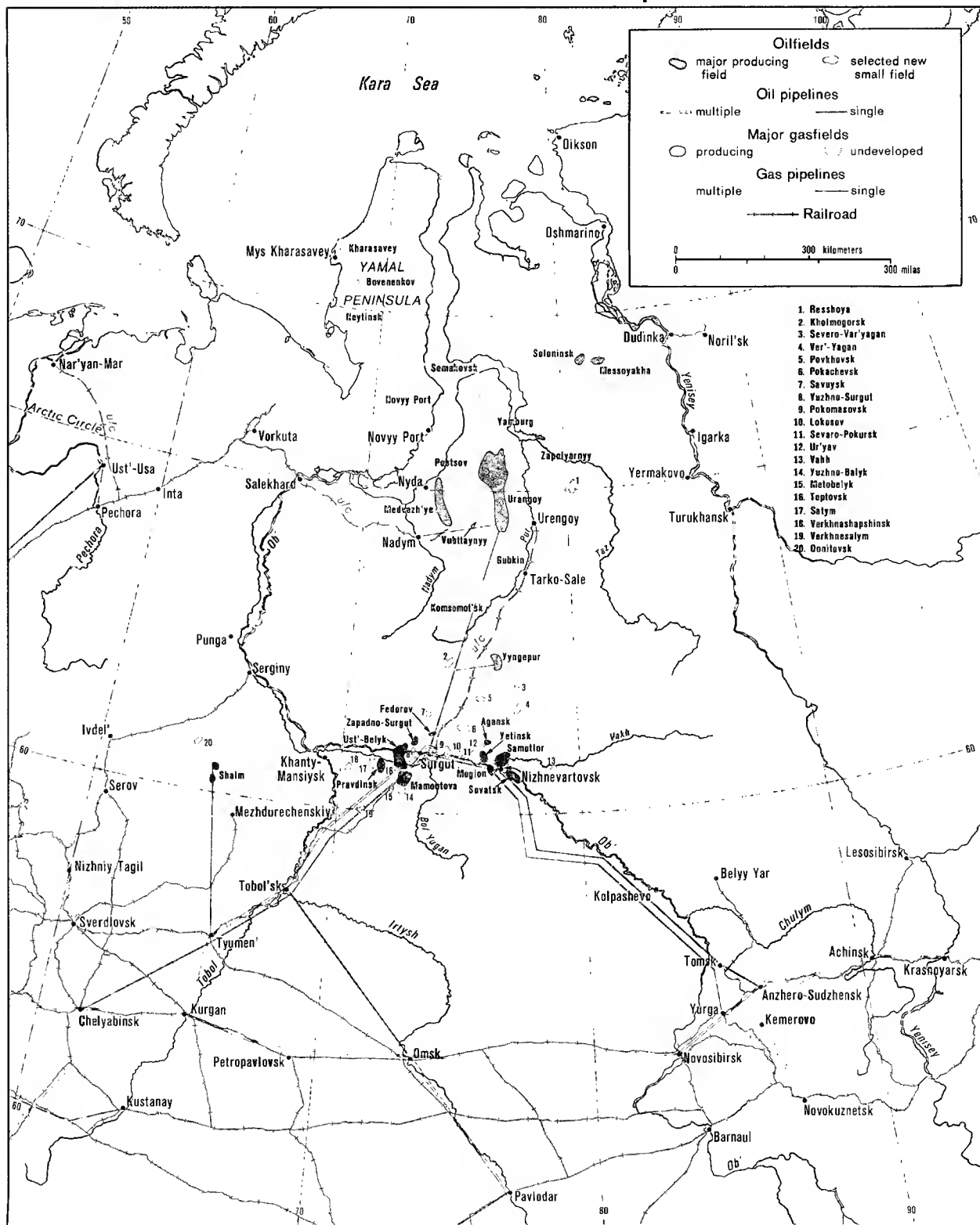
According to Salmanov, oil was to be found on the Yamal Peninsula, in the Pur-Taz region (which includes Urengoy), and in the western and central areas of the Middle Ob. A month earlier Salmanov and the geologist Nesterov had complained that skepticism over Tyumen oil reserves was sufficiently great that "proposals have already appeared to provide as fuel for the Tobol'sk petrochemical combine [one of the larger industrial projects of the five-year plan] not [associated] gas from the Middle Ob deposits, but coal from the Kansk-Achinsk Basin."⁶ [redacted]

Later in 1976 the Tyumen party first secretary, Bogomyakov, critically commented that because the oil resources had not actually been pinned down by detailed geological exploration:

Right away there appear many skeptics, doubters and semidoubters, and absurd figures arise. . . , but our calculations, the calculations of geological organizations, the needs of the country and the possibilities of the region itself convincingly demonstrate that one must not "shut off" the perspectives of the Tyumen complex at 1980, or indeed imagine that in 1980 we will increase extraction by 30-33 million tons, but in 1981 [just] by 5 million tons. What all this means is that it is necessary to fully expand geological work so that a high growth can be provided in the 1980s and 1990s. [redacted]

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USSR: West Siberian Basin Oil and Gas Development



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X1 Bogomyakov's argument was echoed in similar pronouncements that appeared during 1976 and 1977 in the press and technical journals.⁷ In an article written for the literary journal *Oktyabr* (1977, No. 11), the director of the West Siberian Oil Geology Institute, Nesterov, clearly suggested continuity between the old dispute over the presence of oil in Tyumen and the new dispute over the possibility of further giant discoveries.

Once again, the skeptics have not been clearly identified. However, the available evidence indicates a rather broad spectrum of officials. It seems fairly certain that doubters have been found amidst the ranks of Gosplan.⁹ They are found among scientists outside of Tyumen. They also can be found within the Ministry of Geology, both in Moscow and in the field in Tyumen.¹⁰ According to Bogomyakov, Erv'e, the chief of Glavtyumengeologia (the Tyumen Geological Administration) for many years and now USSR Deputy Minister of Geology, has had his moments of doubt,¹¹ which is suggested too by the cautious way Erv'e has treated the north Tyumen oil issue.¹² And, finally, doubters exist within the Ministry of Oil. It is clear from the late Minister of Oil Shashin's speeches that he, for one, thought that Tyumen's oil reserves would soon have to be augmented by equally large discoveries elsewhere—probably in East Siberia. Shashin's successor, Nikolay Mal'tsev, has given no strong public indication that he thinks the solution to the Soviet oil problem lies in Tyumen. One of the oldest specialists in the Ministry, A. P. Krylov, is said to have been opposed to gambling on a major increase in Tyumen output. Shashin's views may well have been influenced by the outlook of his man in charge of Glavtyumenneftegaz (Main Tyumen Oil Administration), Viktor Muravlenko.

X1 Muravlenko, a capable and well-informed administrator who died in 1977, had reached a state of extreme pessimism about oil output prospects in Tyumen by 1976.¹³ Already in 1973 he had indicated his alarm over the failure to discover large new deposits in Tyumen, to explore the northern area of the Middle Ob, and especially to look ahead and prepare "dozens"

of smaller fields for exploitation in the next five-year plan period. In an article that appeared between the December publication of the draft version of *Basic Directions of the Economy of the USSR for the Years 1976-1980*—the Politburo's strategy for the 10th Five-Year Plan—and its confirmation at the 25th Party Congress in March 1976, Muravlenko set out the scale of work that would have to be performed to fulfill the plan and a whole set of conditions that would have to be met if—it was implied—there was to be any hope of plan fulfillment.¹⁴

The question arises: how could such a situation in which there was so much uncertainty about the prospects of West Siberia have come about? The answer is complicated, but reveals much about the management of Soviet oil resources. It turns partly upon information about production and reserves, and partly upon the allocation of resources among competing oil-producing regions.

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Viktor Muravlenko
Chief of Glavtyumenneftegaz
until his death in 1977

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A possibility that should not be ignored is that production and reserve figures may be significantly falsified, or at least may be so subject to manipulation that they could badly mislead top policymakers.

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More fundamental still in explaining the uncertainty surrounding West Siberian prospects is the absence of sufficient data tending either to prove or to disprove the hypothesis that new giant oil deposits are located in Tyumen, or indeed in other prospective regions farther east in Siberia. The lack of hard evidence pinpointing reserves has been a source of deep anxiety among production officials since the early 1970s. By 1972, at the latest, some specialists were convinced that the Middle Ob fields of Tyumen would not suffice to meet Soviet oil needs after 1980.¹⁸ In 1973 Minister of Geology Sidorenko, who was shunted into the Academy of Sciences in 1975, pointed out with alarm the impact of current and anticipated rates of oil extraction on oil reserves, and proclaimed, "We need [read, do not have] general programs to prepare for the exploration of large prospective regions—the North and Polar Urals, Kareliya, the Kyzylkums, the Siberian Platform, and others."¹⁹

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At a big meeting on geological prospecting in Tyumen held in November 1973 and attended by Party Secretary Dolgikh, Gosplan Deputy Chairman Lalayants, Minister of Oil Shashin, RSFSR Minister of Geology Rovnin, and Academicians Styrikovich and Trofimuk, the then obkom first secretary, Shcherbina, criticized the geologists for their "weak tempos of work

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in new, highly prospective regions in the north of the oblast."²⁰ A few month later Shashin declared:

The present high level of oil extraction and maintenance of the achieved levels of growth cannot be provided for by discoveries of the previous period. The discovery of new deposits in the existing oil extracting regions, even of very large ones, can only compensate for the decline of extraction in old deposits, support the achieved high level of extraction and in the best of cases provide for a certain insubstantial growth. Therefore, there arises now as never before the question of the of the need to discover new enormous [krupneishie] oil-bearing provinces equal to the Urals-Volga and West Siberia. East Siberia, the Caspian Depression, and the shelves of seas and oceans, which have enormous potential possibilities for the growth of reserves, may be such regions. But at the present time we are alarmed by the fact that the Ministry of Geology of the USSR is drilling an insufficient volume of exploratory wells in new prospective provinces.²¹

And a meeting was called by the Ministry of Geology in September 1974 specifically to discuss the urgent need to create a new oil base in East Siberia.²²

The level of concern has not receded in the more recent period. Deputy Minister of Oil N. S. Yerofeyev, made the timetable more specific in 1976: "In order to create a reliable base for the further development of the oil industry it is necessary already in the 10th Five-Year Plan [that is, before 1981] to discover and begin to develop a new petroleum province equal to the Urals-Volga or West Siberia."²³ Yet at a huge all-union geological meeting held in Tashkent in October 1976, at which it was acknowledged that "further high tempos of development of the extraction of oil and gas in the country to a considerable extent depend upon the discovery of new large deposits of oil and gas," it became apparent that the relevant institutes had not yet even begun to "give a scientific rationale for the most optimal directions of geological exploratory work" in East Siberia, north Tyumen, the north-eastern part of the European USSR, the Caspian

Depression, or offshore.²⁴ And in a 1978 article Academician Trofimuk was moved to inform his audience that the West Siberian oil reserve situation should not be considered "fatal."²⁵

One reason that so-called predicted reserves have not become proven reserves in Tyumen is that geological prospecting in the region stagnated between 1968 and 1975. During the Ninth Five-Year Plan (1971-75), Glavyumengeologiya fulfilled its plan for deep prospecting-exploratory drilling by only 92 percent, and overfulfilled its plan for growth of reserves of "oil and condensate" by progressively less each year. (The plan indicators, by lumping oil and condensate together, may well have concealed underfulfillment of the target for growth of oil reserves from 1973 on.) This lag caught up with the geologists in 1976 and 1977, when the plan for growth of reserves in Tyumen was not met.

There are technical reasons for this lag. Geologists have been hard put to prepare sufficient areas for test drilling. Soviet geophysical methods have been inadequate for finding potential oil-bearing strata at the deeper depths at which geologists such as Salmanov, Trofimuk, and Nesterov say they are to be found. Seismic equipment has not been up to world standards, and major limitations have been imposed by deficiencies in Soviet computer hardware and software. Serious problems have also been associated with the deep drilling needed to explore for oil and gas: industry has not produced the transportable rigs, drill bits, drilling pipe, and other high-grade equipment needed by geologists. Transportation under Tyumen conditions has been another enormous bottleneck.

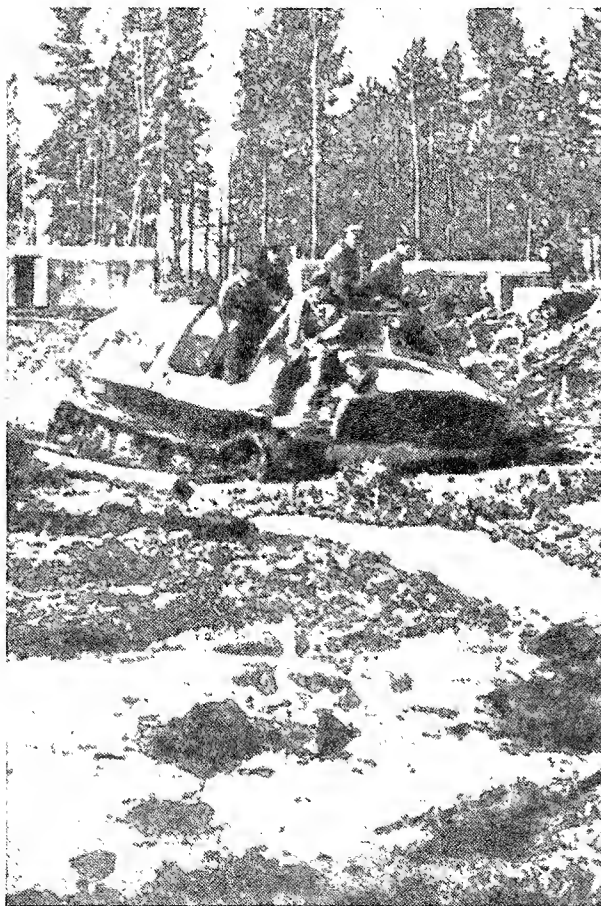
Almost as important as these technical factors restraining the sort of exploration deemed to be necessary, however, has been the impact of the incentive system for rewarding geologists. The "indicator" problems of linking work performed and final results, which are common to any sphere of Soviet economic activity, are here compounded by the difficulty of determining at the completion of a plan period the effectiveness of an activity the true worth of which can only be known after the passage of time.²⁶ Glavyumengeologiya has had a strong material incentive to tolerate the locational pattern of exploration that has tended to emerge from these success indicators

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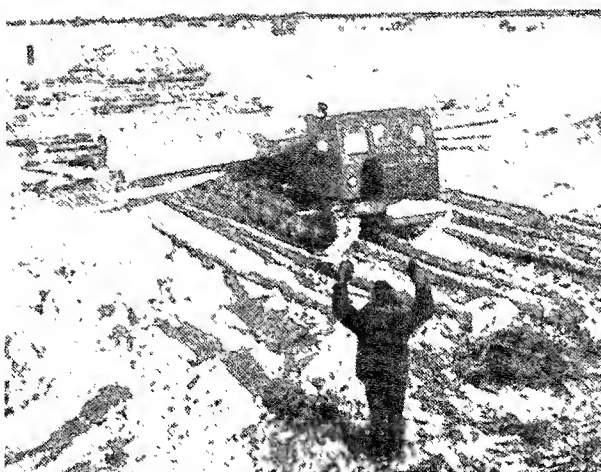


because *its* success has been measured by the aggregate total results for the oblast as a whole, rather than by an indicator sensitive to a geographical pattern of drilling that would promote a long-term growth in proven reserves. [redacted]

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A still more important factor behind the lag in reserves than either equipment deficiencies or incentive systems has been the constant pressure from Moscow for higher and higher immediate oil production. This pressure led, from 1969 through at least 1975, to a heavy concentration of all Tyumen geological prospecting resources—both those of the Ministry of Geology and those of the Ministry of Oil—on the Middle Ob region. Like the counterproductive incentive problem, the inability to sustain a systematic progression from comprehensive geophysical studies of broad regions, to the establishment of a fund of promising sites for deep drilling, to adequate proving of reserves is rooted in the nature of the Soviet economic system. The pressure from above for immediate output was reflected, for instance, in the allocation to the Middle Ob region during the Ninth Five-Year Plan of 14 out of 21 seismic exploration groups, in the fact that 72 percent of deep exploratory drilling was done in the Middle Ob, and in the fact that northern oil exploration expeditions were more poorly equipped than those on the Middle Ob. [redacted]

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Swamp transportation in Samotlor and construction of a winter road

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A bureaucratic power struggle in this instance intensified what was basically a result of planners' preferences. The fundamental interest of the Ministry of Oil, represented by Glavtyumenneftegaz, has been and still is to produce slightly more oil each year than called for by the plan. It has not been significantly rewarded for increasing the stock of oil reserves. Thus, it has been motivated to shift rigs and crews from exploration to production drilling. Because it is politically a far weightier actor than the Ministry of Geology, it has also apparently managed to get more than its share of drilling rigs and equipment out of Gosplan, at the expense of Glavtyumengeologiya. When the Ministry of Oil has argued that its piece of the pie must be larger or the critical yearly oil output plan would not be fulfilled, Gosplan has had that much more reason to listen. [redacted]

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Finally, and most important, geological exploration in Tyumen has been significantly retarded by the deliberate choice of Soviet policymakers. A key article published in *Pravda* on 10 August 1977 revealed that:

- The Ministry of Geology and Gosplan, beginning in 1968, made yearly reductions in budgetary and material allocations to Glavtyumengeologiya.
- Specialized geological exploration drilling trusts had been liquidated in the Ob region and the Yamal Peninsula.
- In the past decade, oil extraction had grown 40 times over, whereas exploratory drilling had "remained at the old level."
- In 1973 the RSFSR Ministry of Geology had taken a special decision forbidding any further search for gas in Tyumen Oblast, "considering that the already explored reserves were sufficient for many years."
- The reequipping of geological exploratory parties had de facto been stopped. [redacted]

According to Salmanov, currently chief of Glavtyumengeologiya, the absolute level of capital construction planned for his administration in 1976 was lower than the level of 1966. Salmanov and other Tyumen-leaning geologists have repeatedly complained of gross discrimination against Tyumen in resource allocation. In their view, much too heavy an investment of resources is being made where the potential payoff is far less than it would be in Tyumen—namely, in the Urals-Volga fields.²⁷ Their resentful attitude toward Gosplan is hardly concealed.²⁸ [redacted]

As we have already seen, Gosplan has been inclined to treat skeptically claims of potential new supergiant fields waiting to be discovered in Tyumen Oblast. But it has been accused also—perhaps justly—of harboring unrealistically high expectations concerning the capacity of Tyumen's proven reserves and of those Tyumen fields already in production, especially Samotlor. In a hard-hitting article written during the period in which fundamental decisions were being made on the five-year plan for 1976-80, by A. Murzin,

one of *Pravda's* two outspoken West Siberian correspondents, Gosplan was accused of failing to look ahead to what would happen after Samotlor peaked "in two years," complacency over Tyumen's production capacity, premature exhaustion of Samotlor through virtually criminally high output targets, and, in general, ignorance of the need for a rapid, comprehensive, and integral development of the smaller deposits in the Middle Ob.²⁹ "Overconfidence" and self-deception may partly explain Gosplan's attitude, but probably more stress should be placed upon a harried weighing of cost factors within the Presidium of the Council of Ministers as well as Gosplan, which has affected not only allocations for geological exploration and development in Tyumen, but the general allocation of resources between West Siberia and the older oil-producing regions. [redacted]

Developments

It should be apparent that despite the high priority assigned to West Siberian oil and gas development, Tyumen did not get everything it wanted or needed during the years 1971-75. Undersatisfaction of Tyumen demands was, indeed, one of the principles of the Ninth Five-Year Plan. At the November 1971 Supreme Soviet session that approved the Ninth Five-Year Plan Kosygin declared, "Along with further development of exploration work in the eastern regions, geologists must strengthen the search for oil, coal, gas, and other useful minerals in the European part of the country." And the plan itself stated, "In the Ninth Five-Year Plan geological prospecting work will be considerably strengthened overall for the country, and especially on the territory of the European part of the USSR."³⁰ [redacted]

A general restraint on resource allocations to Tyumen seems to have appeared imperative to Moscow because of the extremely high costs of Tyumen infrastructure development, the serious problems involved in transporting Tyumen oil and gas to consumers in the European USSR, and the competing claims of various large projects incorporated in the plan for 1971-75. One of the complaints of West Siberians has been that planners view the development of the region as just one among other big projects such as the Kama River

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Arrival of an oil-drilling brigade from the Urals-Volga, typical of manpower shifts employed by the USSR

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Truck Plant, BAM, and Atommash, rather than as an undertaking of a qualitatively greater magnitude and duration. As the five-year plan progressed, West Siberian allocations appear to have become caught up in the overall slowdown of the economy and the response to this by the Soviet leadership. At the Central Committee Plenums in December 1972 and 1973, Brezhnev laid down the line that efficiency should be one of the major goals of Soviet economic activity, and this dictum tended to translate itself into a positive reconsideration of the benefits of investment in the older, European USSR oil-producing regions.

[REDACTED]

There has always been a need to strike a balance between the needs of the old regions and the needs of Tyumen. Although these regions have now ceased to make a significant contribution to the *growth* of Soviet oil output, they were still contributing over 60 percent of total production in 1975 and are planned to contribute over 40 percent in 1980. It has obviously been critical for the Soviet leadership to avert a precipitous decline in the older fields, so the question has been one of precisely where to draw the line between allocations to the old as against new fields.

Great attractions of the older fields from Moscow's standpoint have been the existing capital stock, infrastructure, refinery capacity, and available pool of skilled labor, not to mention proximity to consumers. But an equally great temptation to invest more in the older fields has been the prospect of extracting significantly more oil from already developed fields.

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From at least 1970 onward it appears that there have been major disagreements among Soviet specialists over what percentage of oil is actually being recovered from oilfields. Some officials, like the late Minister of Oil Shashin, have claimed extraordinarily high recovery rates—partly because they may in fact have been convinced of the efficiency of Soviet water-flooding techniques, and to no small extent because they must have perceived the potentiality of the “low recovery” argument to divert resources to the older producing regions. At the 24th Party Congress in 1971 the Tatar obkom first secretary, Fikryat Tabeev, made a big pitch for intensification and for raising recovery rates, and Kosygin hinted at his own position on this issue by

X1 calling for higher recovery in the European oilfields. The Ninth Five-Year Plan itself included a long endorsement of enhanced recovery, with the main stress placed on continued water-flooding and the use of steam and hot water. This theme was then stressed by some Gosplan and Oil Ministry officials (for example, chief of Gosplan's Petroleum and Oil Industry Department, Galonskii, and then Deputy Minister of Oil Mal'tsev), but not by others (including A. E. Probst of Gosplan's SOPS or Minister of Oil Shashin himself). [redacted]

Soon after the December 1973 Plenum of the Central Committee, at which Brezhnev appears to have roundly criticized the Ministry of Oil, the Central Committee's *Ekonomicheskaya gazeta* (1974, No. 11) published a long article entitled "Task of Economic Importance: How to Improve Utilization of Geological Reserves of Oil," signed by "Doctor of Technical Sciences, N. K. Baybakov." In his role of oil expert, Gosplan Chairman Baybakov presented a detailed rationale for a major program of enhanced recovery. A critical factor, Baybakov noted with alarm, was the rising percentage of oil output going simply to compensate for decline in the older fields: 39 percent in the Seventh Five-Year Plan, and 64 percent in the Ninth Five-Year Plan. "In preliminary longer term calculations," he warned, "the proportion of new wells needed to compensate for declining extraction will rise to still greater heights." Production just for compensation was becoming "a weighty factor that is burdening the economy of the branch." [redacted]

X1 The seriousness of the situation arose in part from low rates of oil recovery. Despite the historical virtues of the Soviet water-flooding technique (a politically charged issue attacked only behind closed doors), "enormous" quantities of oil were left in wells that had been shut down, or would be left in wells still being produced. The moral was clear:

The national economic significance of raising the recovery of oil is supported by the large economy of capital investments, material and labor resources. If, for example, one sets the task of extracting additionally at deposits being worked in the prospective period (1976-1990) through raising the recovery rate one billion tons, or

approximately 70 million tons per year [N. B.] then the economy from realizing this measure could be evaluated as many hundreds of millions of rubles of capital investments, a reduction of material and labor resources. . . . It is necessary to keep in mind that increasing recovery by just 1 percent will produce on a countrywide scale many tens of millions of tons per year of additional oil at already created capacities with insignificant capital expenditures and production costs, which is equivalent to the discovery and development of not just a small number of large oil deposits. [redacted]

This recovery effort, which Baybakov indicated had Politburo approval, was to be pushed especially hard in the European USSR (including Azerbaidzhan and the North Caucasus), where there were "difficulties in fully supplying the economy with fuel" that necessitated costly imports from West Siberia: "Already at the present time it is necessary to transport from eastern regions of the country an ever-increasing quantity of oil and gas, which demands enormous capital investments, a great quantity of pipe, machinery for construction of oil and gas trunk pipelines, pumps and compressor stations, and also large labor expenditures." The great economies Baybakov visualized were to come from the introduction of a broad range of artificial lift techniques (submersible pumps and gas lift) and new enhanced recovery means including chemical additives, thermal methods, and open mining. Speaking with an authority that transcended his "doctorate," Baybakov ended by tasking the Ministry of Oil with preparing a long-term oil-recovery program. [redacted]

Baybakov's article was not the last word on recovery, although in due course a long-term recovery program was adopted. Differences of opinion over the issue continued to surface, some directly stimulated by Baybakov's foray. In a general way, the argument tended to pit Gosplan, some officials in the Ministry of Oil (including the present Oil Minister, Mal'tsev), and regional officials who stood to benefit from the stress on recovery (especially from the Urals-Volga area and the Caucasus) against Ministry of Oil officials who probably thought that "recovery" was an evasion of the hard investment decisions needed in the forthcoming

10th Five-Year Plan,³¹ some Academy of Sciences specialists,³² and production officials who knew that enhanced recovery efforts worked against their own financial and career interests under the existing set of success indicators.³³ The argument that enhanced recovery best reflected the party line on the need for greater "efficiency" was countered by the argument that "efficiency" did not mean counterproductive slashes in budgetary and material allocations to Tyumen, but—on the contrary—meant comprehensive, integrated development of the oblast which minimized the waste that resulted from piecemeal development and constant half measures. But lines of disagreement were blurred by the rapid co-option of "recovery" by Tyumen production leaders, who saw large gas-lift projects as one of the possible paths out of the dead end into which they were marching. []

The "recovery" debate was part of a more general controversy over whether economically rational criteria (that is, "rational" in *intra-branch* terms) should govern allocations of funds, resources, and manpower to the older fields, or whether the proper policy should be to maintain the achieved production level in older regions at any price with infill drilling, development of small unproductive fields, and enhanced recovery. As in other areas of controversy focused upon in the Hydrocarbon solution to the Soviet energy problem, there was to be no clear resolution of the recovery issue in the period up to December 1977. []

In 1975 a long-term multibranch recovery program was formally approved, with a parallel research program in the Academy of Sciences. Implementation of this program was placed higher than the commissioning of new oilfields on the formal list of priorities for the oil industry in the 10th Five-Year Plan (1976-80) approved by the 25th Party Congress in March 1976. However, the program has been undercut by major delays in implementation, arising partly out of the disincentives for production personnel to bother with tertiary recovery, and partly out of the absence of necessary materials and equipment. []

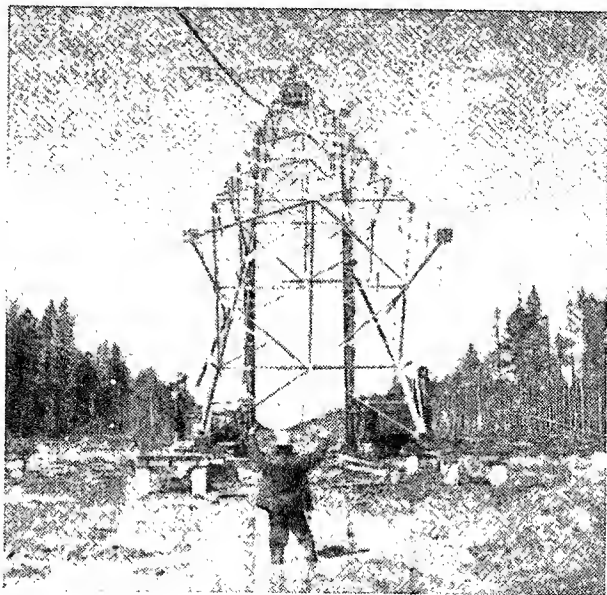
Baybakov's original interest in enhanced recovery was almost certainly stimulated by US experience (or talk) in this field, and acquisition of foreign technology,

materials, and equipment was implicit all along in the program. Yet cranking up the foreign trade component has taken more time, perhaps, than Baybakov suspected. It is now over four years since the Soviets began to talk seriously about recovery, but purchases have been intermittent and the major West Siberian gas-lift contract was not signed until the fall of 1978. []

Meanwhile, the record strongly suggests procrastination on the broader issue of Tyumen development. In 1972-74, []

[] it was generally accepted that it was not economical to develop the small fields in Tyumen. This judgment was soon overtaken by a nonevent—the failure to discover a giant new oilfield in Tyumen. Erosion of the reserve base was magnified by water encroachment at Samotlor and other large fields in the Middle Ob. Soon after final approval of the 10th Five-Year Plan in October 1976, a decision was taken to accelerate the discovery of reserves in West Siberia, which generated a crash program of geological activity in 1977. This campaign was marked by the usual lack of coordination between the Ministry of Geology and Ministry of Oil, and did not resolve the uncertainty over Tyumen oil resources or offer any immediate alternative other than further development in the Middle Ob. []

Thus, during the struggle over the five-year plan in 1975 and 1976, a stark choice confronted the policymakers: should a major commitment of resources be made to commissioning rapidly a relatively large number of small new fields in outlying areas of the Middle Ob, with very large infrastructure costs, or should investment in the small deposits be restrained, Samotlor and other large Middle Ob fields pushed beyond their planned capacities, and maximum efforts made to keep up production in the Urals-Volga region? A second choice, at least in the eyes of Tyumen supporters, was whether a decision would be taken to broaden the whole economic profile of the oblast by a more rapid development of the refining, petrochemical and chemical industries, and (as discussed below) the construction of large gas-fired thermal power plants to supply the Urals and European USSR. []



Mounting a high-voltage line support tower in Tyumen

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Tyumen advocates pressed hard on these points during 1975 and 1976, but did not win.³⁴ In the 10th Five-Year Plan the Soviet leadership tried to prevent a qualitative leap in the already huge investments being poured into Tyumen. Consequently—as noted above—the leadership emphasized recovery and maximum oil extraction from the depleted European USSR fields. It talked about developing the small fields in Tyumen, but did not allocate the resources that were required, thus putting still more pressure on Samotlor and other producing Middle Ob fields—in direct contradiction to the strongest advice it was receiving from Tyumen. In fact, it even assigned “supplementary” oil production targets to Tyumen over and above those already set by the plan for 1976. It did make a major commitment to development of the petrochemical base of West Siberia by including the Tobol’sk and Tomsk projects in the list of key five-year plan construction sites, but this fell far short of creating the type of “territorial production complex” that many thought necessary for optimal exploitation of West Siberian resources. In short, in 1975-76 the leadership took the course that promised the greatest immediate payoff, least immediate cost, and—probably—the least immediate economic and political risk.

The Big Gas Alternative

Strategy

Since the mid-1950s the average annual rate of growth of natural gas production has been significantly greater than that of oil or coal. CIA projects a fairly steady annual rate of growth of about 6 percent through 1990.³⁵ Despite problems that have occurred in extraction and transportation, gas has certainly been a success in comparison with the record of many other branches of the Soviet economy, and its future growth prospects are correspondingly bright. Yet gas production may be examined not only in the context of progress or failure to meet one-year and five-year plan targets, but also in the context of the gap between what these plans have been and what they *might* have been if there had been the political will to pursue an “unbalanced,” gas-oriented energy strategy.

The argument for an energy strategy that places far more emphasis on natural gas development than is currently the case (a strategy we shall refer to as Big Gas) is quite simple.³⁶ Gas is the one energy branch in which the resource base and level of existing technology could conceivably permit a relatively rapid leap in output. According to published Soviet figures, proven and probable gas reserves are enormous; in 1977 the ratio of reserves to production was 84, far higher than the estimated ratio for oil. There is some question as to the firmness of these figures—a subject discussed below. But obviously a huge gap exists between output and potential output that could in principle provide a base for “solving” the Soviet energy problem in the near-to-middle term. The bulk of the currently known reserves are found in the north of Tyumen, although new resources have recently been discovered in Astrakhan, north of the Caspian Sea. In Tyumen high-quality gas is found at shallow depths in a relatively small number of giant fields. Extraction costs, it is argued, are extremely low. Thus the Big Gas strategy requires large-scale development of Medvezh’ye, Urengoy, and other north Tyumen fields, many of them located above the Arctic Circle.

The key to the Big Gas strategy has been transportation of the gas by pipeline out of north Tyumen to the Urals, European USSR, and abroad. It is part of the Big Gas strategy that gas be used as a fuel for power plants, and some argue that part of the gas should be used to fire thermal stations right in Tyumen, with the transmission of energy over long-distance powerlines to the Urals and farther west. Once the gas has been transported, there must be a major substitution of gas for oil in power generation, more use of it as a feedstock for chemical production, and some use of it as a fuel for transport. Gas is seen as a highly versatile, clean, and easily handled fuel that can release oil for deeper refining and more profitable use. Through its export potential, gas also is viewed as having the capacity to finance its own development. []

Proponents and Opponents

The main actors in the debate over gas consist of a hard core of Big Gas supporters, some outright opponents, and a larger and more ambivalent "floating" group in the middle. Because of a common outlook and the geographical location of the main gas reserves, there has been much overlap of Big Gas proponents with supporters of the Hydrocarbon solution. There is no question in the minds of both that a maximum effort must be made to raise oil output in Tyumen; the only question is whether, in addition, an extraordinary effort to sharply increase gas production is feasible. Tyumen political leaders such as Bogomyakov and Shmal', economic administrators such as the chief of Glavtyumengeologiya, Salmanov, and specialists like V. S. Bulatov of Tyumen NIIGiprogaz and Nesterov have been among the most vocal advocates of Big Gas. They have been supported by academician Abel Aganbegyan, director of the Institute of Economics and Organization of Industrial Production of the Siberian Division of the Academy of Sciences. []

In Moscow the most vociferous, and probably the most prominent, advocate of Big Gas has been the Minister of Construction of Petroleum and Gas Industry Enterprises, Boris Shcherbina. Shcherbina long ago went on record as believing that gas development could bring about a radical shift in the Soviet energy balance, and he has held to this position. An acceleration of Tyumen's gas industry would have enhanced Shcherbina's role when he was first secretary of Tyumen obkom before 1973, and it unquestionably



Abel Aganbegyan
Director, Institute of Economics
and Organization of Industrial Production

would promote his personal and bureaucratic interests now: it is his ministry that builds the pipelines from Tyumen. Shcherbina may have been joined by leaders of the USSR Ministry of Geology, who also have probably stood to gain institutionally from an expansion of the gas industry, and by the Ministry of Foreign Trade. Other Moscow-based supporters have probably included former Minister of Oil Shashin, who was interested in dampening the rising demand for oil, and Academician Nekrasov, the chairman of Gosplan's SOPS.³⁷ None of these individuals were centrally located in the energy policymaking structure, although Shcherbina and Shashin had good access to the top decisionmaking authorities, and Nekrasov had contacts outside Gosplan in the Academy of Sciences, the State Committee for Science and Technology, the Presidium of the Council of Ministers, and—probably—the Central Committee apparatus. []

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The opposition to Big Gas has almost certainly been strongest where at first glance one might least expect it: in the Ministry of Gas itself. [REDACTED]

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Kortunov's successor in 1972, the Azerbaidzhani Sabit Orudzhev, has been the most vocal opponent of the Big Gas strategy.³⁸ Over the years he has consistently rejected all major aspects of this solution to the energy problem. (His views are discussed below.) In this respect his attitude toward Tyumen development has been markedly different from that of Shashin and the Ministry of Oil, who wanted to accelerate Tyumen oil production but appear to have thought that this would be insufficient to sustain the Hydrocarbon energy strategy. [REDACTED]

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The fact that the minister responsible for gas production has visibly resisted Tyumen and displayed a preference for the more temperate Orenburg zone, where production and pipeline problems are not as great as in northern Tyumen, can hardly have been an argument in favor of the Big Gas strategy in the eyes of Soviet leaders unversed in energy matters. Orudzhev, to an even greater degree than his opponent Shcherbina, has had a thoroughly "political" past. Like Baybakov, Orudzhev is a charter member of the Stalin-generation politico-economic elite in Azerbaidzhan. And it can only have been through long-cultivated connections in the party Central Committee apparatus that Orudzhev recouped his fortunes in the early 1960s and got himself promoted from Deputy Minister of Oil to Minister of Gas in 1972. At this juncture he may have received support from the Azerbaidzhan first secretary, Aliyev, or the Central Committee CPSU secretary, Kapitonov, but in the final analysis his promotion must have been approved by Kirilenko or Brezhnev, and probably both. [REDACTED]

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The middle group, larger than either the proponents or opponents of the Big Gas strategy, has swung from a willingness and even eagerness in the early 1970s to consider the gas option to a conviction by 1975-76 that it could not—or should not—be implemented. This was the "majority" opinion Academy of Sciences President Aleksandrov referred to in 1977 that thought that gas was not the solution to the Soviet energy problem.³⁹ It includes Kosygin and Baybakov for certain, probably Deputy Chairmen Novikov and Dymshits, and perhaps Party Secretary Dolgikh. It also appears to include virtually the entire high-level scientific energy advisory corps of Kirillin, Aleksandrov, Styrikovich, Melent'ev, and Mel'nikov. As we shall see below, the Academy advice may be sincere, but it has been far from disinterested. [REDACTED]

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Issues

The main issues involved in the discussion of Big Gas have been gas reserves and production capacity, the cost of north Tyumen development, gas transportation, and gas utilization. These issues have interacted with broader questions of economic policy (for example, development of the steel industry) and Soviet foreign economic relations. [REDACTED]

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The discovery of enormous gas deposits in north Tyumen during the 1960s led to increasingly bold projections of future output. It is instructive here to note the escalation in Shcherbina's estimates of Tyumen's production capacity. In 1966 he asserted that by 1975 Tyumen could produce as much gas as the entire country did in 1975, that is, 128 billion cubic meters (Tyumen's 1975 output in fact turned out to be 36 billion). At a Tyumen Oblast party conference in 1968, Shcherbina claimed that on the basis of known reserves it was now possible to produce 300 billion, and in the future 400-500 billion. Two years later he stated that the present potential was "over" 500 billion, with a future potential of "over 1 trillion." By 1973 he stated to the Presidium of the Siberian Division of the Academy of Sciences that the reserve base would already support a production level of 600-700 billion. And by 1974 he was asserting that it would presently be possible to produce 700 billion, with a possibility in the very near future of 1.5 trillion. Shcherbina was not talking abstractly here about a theoretically desirable ratio of production to reserves, but about targets at which policy should actually aim. [REDACTED]

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*Drilling site during the
West Siberian winter*

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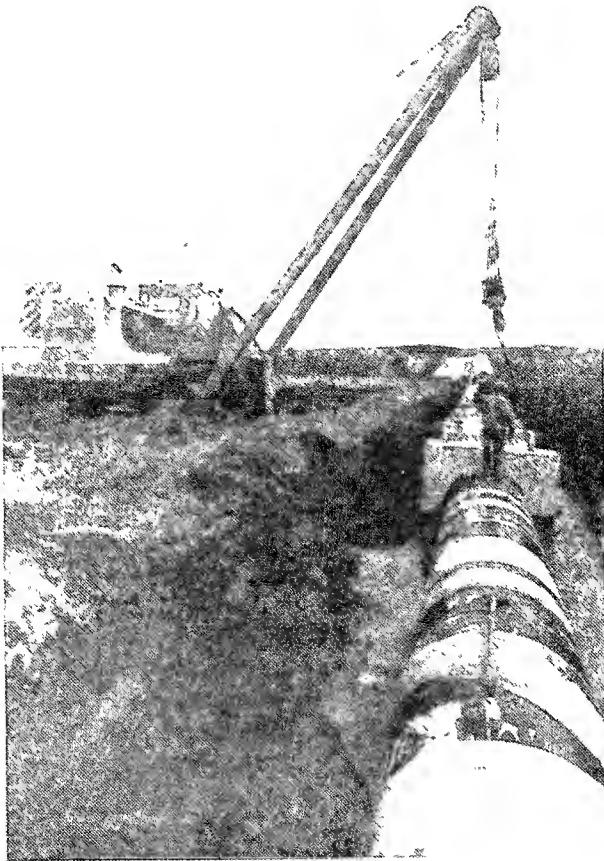
In all probability the annual capacity figures Shcherbina has employed have not been as hard as he has made them appear to be; that is to say, economic policymakers have probably been confronted with a broader range of uncertainty at both the high and low ends of estimates. As in the case of oil reserves, the setting of gas reserves and peak production capacity is a highly politicized activity that engages the basic institutional interests of the Ministries of Gas and Geology and the career interests of their leaders. It has been asserted, for example, that when the annual capacity of Medvezh'ye was being negotiated, the Ministry of Gas successfully defended its interest in a low-peak capacity by manipulating an artificial distinction between so-called economically exploitable (*balansovye*) and noneconomically exploitable (*zabalansovye*) reserves, leading to a ludicrously low figure that severely damaged the Ministry of Geol-

ogy's interests. (The geologists are paid four times less for discovering reserves officially categorized "noneconomically exploitable.")

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Laying a gas trunkline
from Medvezh'ye through
swampy terrain

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If technical metallurgical problems could be resolved, the two most logical responses to the pipe production problem would be either to increase total steel production, making more available for pipes, or to reallocate existing output among end users. Both responses raise what have so far proven to be intractable political issues. Consequently, the Soviets have been compelled to seek relief by purchasing large quantities of pipe abroad, either with scarce hard currency or by mortgaging future output through compensation deals. This has not been comfortable for Soviet leaders. In the eyes of some officials the whole conventional, large-diameter pipeline approach to gas transportation is rapidly becoming untenable. As Shcherbina put it in 1975, "Despite the perfecting of welding and assembly machinery, and increase in pipe diameters and improvement in quality, the possibilities of improving the traditional technology of transporting oil and gas by pipelines will quickly be exhausted."⁴² [REDACTED]

Since the early 1970s Kosygin and Baybakov have lent their support to attempts to find more cost-effective means of transporting natural gas. The three most promising lines of attack have been in reducing the temperature of the gas (thereby increasing the volume transmitted), raising the pressure in the pipelines (thereby increasing the flow), and packaging the gas in solid hydrate form in "capsules" (thereby reducing the drag). Research has been promoted in each of the three areas, but has so far had no impact whatsoever on the actual transport of gas. [REDACTED]

Transportation has been the crux issue involved in the Big Gas strategy; the problem over which the Soviet economic leadership and consultative bodies have most agonized, and the one which they have least successfully resolved. Here, in concentrated form, are expressed the problems of remoteness of sources from consumers, Arctic development, resource allocation within the economy as a whole, technological lag, and involvement with capitalism in the international economy. The details of pipeline construction have been treated elsewhere.⁴⁰ What should be stressed here is the inability of Soviet domestic pipe mills and machine-building plants to supply the quantity and quality of pipe, compressors, and valves required for the gas industry, and the continual search by the leadership for some alternative to conventional large or superlarge diameter pipeline transport.⁴¹ [REDACTED]

How to build pipelines has been one issue, but *where* to build them has been another. Medvezh'ye, Urengoy, and the other large gasfields are located roughly 1,100 kilometers north of Tyumen City and the Urals heavy industrial oblasts of Chelyabinsk, Sverdlovsk, and Perm. The shortest route to the central, north, and west European regions of the USSR, as well as to the main gas export markets, lies along a line stretching southwest from north Tyumen through the industrially undeveloped Komi Republic, bypassing the Urals and Volga industrial centers far to the south. Since the mid-1960s the issue debated has been whether to take the north Tyumen gas out through this "Northway," or to follow a "Southway" dropping down to Surgut and Tyumen City and then west to the Urals and beyond. [REDACTED]

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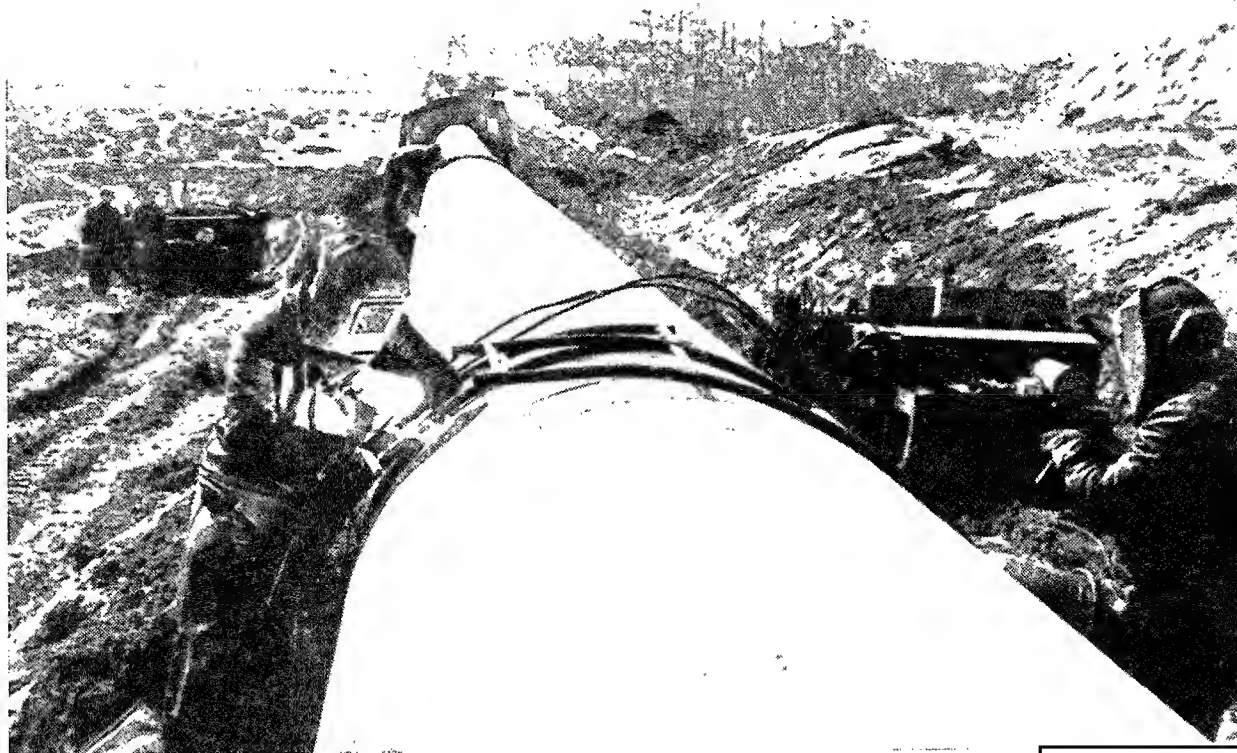
One critical issue here has been permafrost, which covers significantly more of the path of the Northway than of the Southway. In 1967-68 the initial decision went in favor of the Northway, and construction was completed in late 1971 of the "Northern Lights" trunkline running from Nadym (Medvezh'ye) to Ukhta (Komi ASSR) to Torzhok with a connection to Moscow (see the foldout map at the end of this paper). The design for this line called for special pipes and supports to prevent melting of the permafrost. However, because of a lack of the specified materials, then Minister of Gas Kortunov personally ordered that the line be constructed of ordinary pipe simply laid on the ground. With the spring thaw in 1972, the pipes split open and sank into the permafrost, provoking a major "scandal." Responsibility for the technical side of this fiasco was palmed off on the hapless director of the institute that had designed the pipeline (despite the design's permafrost specifications), and Kortunov was put in charge of a newly created Ministry of Construction of Petroleum and Gas Industry Enterprises, which made him responsible again for pipeline construction! The political outcome was that those opposed to the "northern strategy" used the episode to prove that major gas trunkline construction across the northern permafrost areas was not feasible and to shift the main focus of attention away from Tyumen gas onto the comparatively small but far more accessible Orenburg gasfield. This reduction in the priority of development of the north Tyumen fields may well have implied less interest in export of this gas to the hard currency market. It also probably mirrored an intention to save Tyumen gas for more "qualified" consumers, particularly the Urals metallurgical industry, rather than to transport it to regions where more of it would be used as boiler fuel.⁴³ This objective is simply one facet of a broader controversy over how natural gas should be utilized. [redacted]

The outright opponents of Big Gas have argued their case largely in terms of a particular vision of gas utilization, articulated most consistently by the Minister of Gas, Orudzhev.⁴⁴ Orudzhev has repeatedly stated that natural gas should be considered an extremely valuable nonrenewable resource; that its price should be steeply raised and conservation measures enacted;

and that it should not be used as a boiler fuel, but used more and more only for industrial purposes. Not surprisingly, Orudzhev has strongly resisted the North Star project to export liquefied natural gas to the capitalist West, although he has been happy enough to receive imported Western equipment for the gas industry. In this context he and others have argued that exporting natural gas to the West is to sell one's patrimony and behave—wittingly or not—in an unpatriotic manner. [redacted]

Orudzhev's personal interests are well served by his principles. Northern gas extraction and pipeline operation have been beset with constant difficulties, and these would be multiplied several fold by the implementation of a Big Gas strategy. Unlike Shcherbina, Orudzhev has probably no higher aspiration than hanging on to his job. To protect this interest, he needs as modest a plan as possible, together with as much certainty and control over the situation as can be attained. His manifest concern over gas conservation mirrors the politically unpleasant role he must perform of denying gas to whole oblasts during interruptions in supply—especially in the wintertime. Despite technical difficulties, Orenburg gas suited Orudzhev's needs to have a more comfortable alternative to rapid Tyumen development, and it could be justified in ideologically strong terms as a response to the objective requirements of economic "integration" within the "socialist commonwealth" even though it made little contribution to a solution to the larger Soviet energy problem. By the same token, Orudzhev's "patriotic" attack on gas deals with the capitalists, however unjustified in terms of the size of declared Soviet reserves, the small amounts of gas actually involved, and the need for Western financial support of Soviet energy resource development, has probably struck a responsive chord in some circles of the Soviet hierarchy and has enhanced the political risk of urging deeper involvement with and concessions to the West in the gas area. [redacted]

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Construction of the Orenburg
gas trunkline to Eastern Europe

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Yet Orudzhev's position on gas utilization has not gone unchallenged. In the second half of 1976, when the current five-year plan objectives were still being firmed up, the Tyumen obkom first secretary, Bogomyakov, explicitly joined issue with Orudzhev in a sharply worded appeal for a Big Gas strategy:

I do not agree, for example, with the Minister of Gas S. A. Orudzhev, who is beginning to play down the possibilities of development of the branch, saying that we ought to elaborate a long-term program to reduce the utilization of natural gas as a boiler fuel. If we do not increase the use of gas for this purpose then there will simply be nowhere to employ it. The growth of gas extraction cannot be used just by highly qualified consumers. We must shift more and more gas to the production of electrical energy—this is where the future of the branch development lies, which has colossal possibilities in our [Tyumen] complex.

Here are some data. Among the deposits discovered in the oblast, 17 have already been prepared for industrial development. If one were to think today about superhigh tempos of development and doing what up to now the country has not been able—to increase each year the extraction of Tyumen gas by 40 billion cubic meters—then by the end our century, by 2000, we could raise extraction to a trillion cubic meters. The undiscovered potential reserves are estimated to be two-to-three times larger than the discovered reserves. One asks oneself, wouldn't we be niggardly not to use such a lavish gift of nature?

Development of the gas industry to a large extent depends upon a reevaluation of the significance of gas as a fuel. [REDACTED]

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By "reevaluation" Bogomyakov meant elevation of electric power generation to a status equal to that of oil and gas extraction in the Tyumen economy, with construction of 10,000- to 20,000-megawatt gas-fired stations for power generation for the European USSR region. In a remarkably frank put-down of the Big Coal strategy, Bogomyakov continued:

If you compare a gas power plant with a coal one—it's like a toy alongside a mastodon! I am not against developing the Kansk-Achinsk coalfields and building electric stations there. The Krasnoyarsk comrades act correctly when they energetically press the solution of these questions. Let them build coal power stations quickly and provide in this fashion not only for today's needs of the region, but also its long-term future. Let them locate near these power stations much energy-intensive production. But when they try to convince me that the KATEK [Kansk-Achinsk Fuel-Energy Complex] power stations are being built in order that their electricity even now may be transmitted to the Urals and the European regions of the country, this sounds economically unconvincing to me. An analogous decision based on Tyumen gas would be more profitable.

To return to the starting point of our thought I would like to repeat: the indeterminacy of perspectives on the future hinders the creation of a firm development plan for the Tyumen complex. Because of this our tempos even today are lagging.⁴⁵

The fact that Bogomyakov could so openly call into question an important component of the energy balance strategy enunciated several months earlier at the 25th Party Congress does indeed point to an "indeterminacy of perspectives." But ambivalence over Tyumen gas goes back a long way. []

Developments

As early as 1965, Shcherbina was lobbying at a Supreme Soviet session for a Big Gas system that would deliver north Tyumen gas to the Center, Northwest, Belorussia, and the Baltic republics, and favorably contrasting this variant with gas supply from Central Asia. Following the party congress in the spring of 1966 he reported to a meeting of the Tyumen

party *aktiv* that the Council of Ministers had given the go-ahead for design work to begin on a Big Gas system, and in July 1966 a Council of Ministers resolution actually instructed the Ministry of Geology and Ministry of Gas to work out a 10-year plan for developing north Tyumen gas that would raise output in 1975 to 110-120 billion cubic meters. A decision was taken in 1967-68 to build the "Northern Lights" pipeline from Medvezh'ye to Moscow, and construction got under way in 1970. []

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Despite intense lobbying, however, the momentum behind Big Gas development was not sustained. Kosygin's fact-finding trip to Tyumen in January 1968 apparently did not enlist his support for Big Gas, and the critical 11 December 1969 Central Committee and Council of Ministers resolution on Tyumen development called only for acceleration of *oil* extraction. A Ministry of Gas delegation that visited Tyumen in late 1969 or early January 1970 lowered the 1975 target to 70 billion cubic meters. Although further attempts were made to reassert the importance of north Tyumen gas,⁴⁶ its subordinate role for the time being in Tyumen development was confirmed by the Ninth Five-Year Plan (1971-75).⁴⁷ By the end of 1972 the 1975 target was said to be only 44 billion cubic meters. []

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Despite the drift of plan decisions, though, much thought was being given to Tyumen gas. Hopes had initially been fixed on the extraction of gas from Medvezh'ye via the "Northway" route. When the "Northern Lights" pipeline disaster became apparent in the spring of 1972, just as a study was completed that showed the limits to future growth of oil production, the Ministry of Gas and several other organizations were assigned the task—with Baybakov's approval—of designing a system to transport sufficient north Tyumen gas to "solve" the Soviet energy problem to the year 2000. The so-called Big System that was proposed featured the delivery of 130 billion cubic meters of gas per year to the Urals region and 170 billion to the European USSR through a set of 10 parallel pipelines following a "Southway" route from Urengoy that traversed the least permafrost.⁴⁸ The preliminary estimates of this proposal presented to Gosplan in September and October 1972 are said to have indicated a cost of 22 billion rubles and a need for

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20 million tons of steel (approximately 20 percent of one year's total USSR steel output). Phased over a number of years, this would not appear to have been an unreasonable proposition. Nevertheless, at this important juncture, confronted by what they undoubtedly perceived as unacceptably high costs (especially in metal), economic policymakers recoiled from the notion of solving the Soviet energy problem at one stroke with the "Big System" and sought alternative solutions. [REDACTED]

One possibility was to finance northern gas development through compensation deals with the West. This idea went back at least to the 1964-65 period, following the major gas discoveries in Tyumen. It was strongly supported by Kosygin's energy adviser I. A. Popyrin, who—it is said—was especially interested at that time in the hard currency earning aspects of such trade. Two large liquefied natural gas projects were proposed in the second half of the 1960s based on north Tyumen and Yakutiya. Initial negotiations with the French "Gaz Ocean" firm in the late 1960s fell through, but interest in the projects heightened with the growth of detente in the early 1970s and reached a peak in 1972 with President Nixon's trip to Moscow. [REDACTED]

Between 1972 and 1974 the Soviet leadership apparently seriously hoped that the North Star and Yakutiya deals would provide a mechanism for acquiring the financial resources, pipes, and compressors needed to lay the foundation for a Big Gas strategy. The negotiations over North Star, difficult to begin with, were attacked by influential figures within the Soviet elite—including Minister of Gas Kortunov and his successor, Orudzhev. Orudzhev's general opposition to Big Gas, described above, was reinforced in this instance by his recognition that he would find himself in the untenable situation of having to answer before the Politburo for *written* complaints from the Americans concerning the delays and foulups which would be inevitable on the Soviet side. When passage of the Stevenson Amendment in December 1974 blasted hopes of getting the large credits needed to finance North Star, evoking Soviet anger and subsequent rejection of the US-USSR Trade Agreement, it became clear to Soviet policymakers that their energy problem was unlikely to receive a quick fix from the West, but by this time nearly three more years had passed. The large gas pipe import deals that were

consumated with the Germans, Japanese, and others since the 1972 summit compensated for inadequate Soviet pipe production but did not permit a Big Gas breakthrough. [REDACTED]

Meanwhile, following the rejection of the "Big System" in late 1972, other domestic alternatives were also being canvassed. A decree adopted by the Council of Ministers in November 1972 called for additional construction of pipeline and compressor stations on the Central Asia - Center system, as well as work on the Orenburg deposits. And at about this time the so-called Big Commission chaired by Academician Styrikovich was created and assigned the task of exploring all possible solutions to the Soviet energy problem. [REDACTED]

In the gasfield area a possible avenue of attack was pursued, as mentioned above, by a subcommission of the Big Commission formed to explore the possibilities of capsule transportation of natural gas in hydrate form.⁴⁹ The key members of this group were the chairman, Academician Nikolay Cherskii, chairman of the Yakutsk Division of the Academy of Sciences, and Baybakov's energy adviser, Yuri Bokserman. This subcommission worked out a plan to build the "Big System" as a capsule system using three pipelines instead of 10. According to Gosplan calculations the capsule system would transport the same volume of gas as the "Big System," but at a cost of only 8 billion rubles investment and 7 million tons of steel. [REDACTED]

The proposed capsule system was strongly opposed by Styrikovich (who later switched sides), by some other scientists who disagreed with the principle underlying capsule transportation, by the main gas institute (VNIIGaz), which had a vested interest in designing its own system of long-distance gas transportation, and by Orudzhev personally. After gaining Styrikovich's backing and that of Central Committee Secretary Dolgikh, as well as Baybakov's strong patronage and assistance from Popyrin, the capsule transport proposal was formally approved: first by the Big Commission (representing essentially the Academy of Sciences), then by the Collegium of Gosplan, and finally by the Presidium of the Council of Ministers. On 23 May 1974 the Presidium passed an elaborate resolu-

tion over Orudzhev's objections organizing a special institute to design capsule systems and setting out some 28 projects to be worked on, including the Urengoy-Moscow system. [REDACTED]

Between 1973 and 1975, Big Gas remained in limbo. No comprehensive gas program was formulated, as Big Gas proponents argued their case and skeptics voiced various objections. At a Gosplan Collegium meeting at the end of 1973 devoted to a "serious discussion" of Tyumen prospects, Erv'e, the head of Glavtyumen-geologiya, presented strong arguments in favor of rapid development of Tyumen gas; and, summing up the discussion, Baybakov agreed that a plan should be energetically drawn up, *provided* that new solutions to the transport problem were found which reduced the expenditure of pipe.⁵⁰ In the middle of 1974, *Pravda* published an article by Shcherbina that compared gas favorably with coal;⁵¹ and in 1975 Shcherbina demanded a radically new Big Gas approach featuring gas-burning power stations in Tyumen, low-temperature and liquefied transportation of gas, and rapid production of the multiwalled large-diameter pipe sponsored by the president of the Ukrainian Academy of Sciences, Boris Paton.⁵² The RSFSR Minister of Geology L. I. Rovnin, an old Tyumen hand, proclaimed that while "the main attention now is concentrated on the search for oil, and this is correct," this did *not* mean that the search for additional gas reserves in Tyumen should be halted, since "our country in the near future plans sharply to increase the extraction of gas and in the shortest possible time raise it to 1 trillion cubic meters a year."⁵³ There were also elaborate technical arguments defending the low cost of Tyumen gas, particularly in comparison with Kansk-Achinsk coal.⁵⁴ [REDACTED]

But, as Shcherbina complained, there was also "vacillation" in the evaluation of north Tyumen gas, particularly among the core group of Academy of Sciences energy advisers. In an article on optimization of the fuel-energy balance, Academician Melent'ev emphasized that it took almost three times as much metal and 19 times as much pipe to produce an increment of 100 million tons of standard fuel from gas as from coal; and he also stressed the long leadtime needed to develop West Siberian gas.⁵⁵ In 1974 and 1975 Academician Styrikovich began emphasizing the

need to focus on the extraction of gas *condensate*—a line that had clear anti-Big Gas implications.⁵⁶ And in 1975 Academician Mel'nikov dwelt on the rising costs of gas extraction and "difficulties" in supplying pipe, while he ignored altogether the possibilities of a sharp increase in gas production.⁵⁷ These doubts reflected a shift toward the Combined Resources strategy discussed below. [REDACTED]

By 1975-76 the key issue had become whether or not the 10th Five-Year Plan (1976-80) would force the pace on gas. There was some reason to suppose that it might, not only because of the presence of large gas reserves and the problems being encountered in oil production, but also because one of two potential technical breakthroughs in gas transportation—the capsule system—apparently had by this time come to be seen as sufficiently promising to evoke a reconsideration of the "Big System." [REDACTED]

In the two-month interval before publication of the *Basic Directions*, it was apparently accepted in Gosplan circles that there would indeed be a "Big System"-type development of Urengoy. [REDACTED]

However, when the *Basic Directions* was published in *Pravda* on 14 December 1975, at the time of the pre-Congress plenum of the Central Committee, the document contained only a vague reference to the need to "accelerate scientific research and experimental design work in creating fundamentally new types of gas transportation." There was no mention of the capsule system, no mention of Urengoy or Medvezh'ye, no mention of the construction of any gas pipeline from

north Tyumen, no mention of large-diameter pipe production, and only a passing reference to the target of 115-145 billion cubic meters of gas from West Siberia by 1980—a relatively modest figure in the “Big System” context. The low priority indicated by these omissions appears to have been sustained throughout the process of adoption of the five-year plan in 1976, despite lobbying efforts to the contrary.

It is clear that, once again, the Soviet leadership had avoided a decision on Big Gas development. Reluctance to make a large commitment of resources to an untested and risky new technology was undoubtedly a factor, to the extent that revivification of the “Big System” was tied to the capsule system. There was also the investment factor in general. Kosygin’s report at the 25th Party Congress suggested that he, for one, was concerned about the cost of gas transportation and the drain it imposed on the Soviet metallurgical industry; the thrust of his remarks was that gas pipeline construction should be constrained in the 10th Five-Year Plan. But there may also have been highly personal considerations involved, which—if true—cast a revealing light on Soviet energy policymaking.

While Big Gas was thus provisionally laid to rest by Soviet policymakers in 1976, considerable ambiguity remained as to what in general *would* be done in north Tyumen during 1976-80, and what specifically would happen to Urengoy. The fact that Bogomyakov's attack on Orudzhev and appeal for large-scale development of Tyumen gas was published in late 1976 suggests, as noted above, that there was as much "non-decision" as decision in the 10th Five-Year Plan.

In June 1975, Orudzhev had mentioned the possibility of building three pipelines from Urengoy in the 1976-80 period, but had cast doubt on the feasibility of this by observing that existing technology could not cope with such a task. At an unusual joint meeting of the Collegiums of the Ministry of Construction of Petroleum and Gas Industry Enterprises and Ministry of Gas in December 1975, an "elaborated program" was approved for building a system of pipelines along the "Northway" route of Urengoy-Nadym-Punga-Vuktyl-Torzhok-Minsk-Ivatsevich-Dolina-Uzhgorod-USSR border. According to Shcherbina's deputy, Yu. P. Batalin (formerly in charge of pipeline construction in Tyumen), this project—which would transport Komi as well as Tyumen gas—was "the most important task of the Ministry of Gas and Ministry of Construction of Petroleum and Gas Industry Enterprise collectives." It was to be completed in a single year—1976—and carry 80 percent of the USSR's total growth in gas output. There was no mention of any other line from Urengoy.⁶⁰ Only two disconnected sections of the line, however, were in fact completed in 1976; and Urengoy itself was not linked to this old "Northern Lights" route until 1978. In the meantime, the "Northway" strategy of tapping Tyumen gas had given way, once again, to a "Southway" approach. This shift was manifested in a sudden decision to proceed with a pipeline from Urengoy to the Urals city of Chelyabinsk, and to build it in a single year.

Although work on the Urengoy field itself was under way in 1976, one presumably well-informed official, the director of the Tyumen State Scientific Research and Design Institute of Natural Gas of the Ministry of Gas, laid out a "southern variant" of Tyumen gas development in which the Vyngapur, Gubkin, and Komsomol'sk gasfields would be produced during the 10th Five-Year Plan in order to feed the Tobol'sk

petrochemical combine further south in Tyumen Oblast (as Orudzhev probably favored), but in which the actual production date of Urengoy was left ambiguous. This official, P. T. Shmyglya, who did mention that the "southern variant" involved "construction of a system of trunklines from the northern regions of Tyumen Oblast to the Urals (Urengoy-Chelyabinsk)," nevertheless placed more emphasis in his article upon the near-term cost-effectiveness of reconstructing Medvezh'ye.⁶¹ The schedule for bringing Urengoy into operation and the pipeline approach to it appears to have been still undecided as late as July 1977.⁶² Perhaps the first unambiguous public reference to construction of a Urengoy-Chelyabinsk line occurred in October 1977.⁶³ In November there was an authoritative reference to the construction of *four* pipelines from Urengoy: Urengoy-Punga-State Border ("Northern Lights" route); Urengoy-Chelyabinsk; Urengoy-Kuibyshev; and Urengoy-Punga-Nizhnaya Tura-Perm-Elets ("Urengoy-Center" route).⁶⁴ But neither of these references provided a time framework or suggested any particular sense of urgency; this was to come only after the December 1977 Plenum of the Central Committee.

The Combined Resources and Big Coal Alternatives

At the present time the operational implications of both the Combined Resources and the Big Coal strategies converge on coal development. Therefore the two are treated together in this appendix under the rubric of Combined Resources. The difference between the two strategies is that while Combined Resources stresses coal *and* other resources, Big Coal discounts the early availability of substitutes other than coal for hydrocarbons. As Chukhanov, the leading Big Coal proponent, puts it in a thinly veiled reference to the Soviet situation:

It is not easy to find a way out of the situation which has come about. Great hopes are placed in many countries [sic], including the USA, in atomic electric stations, but as long as there are not sufficiently cheap and reliable breeder reactors, the provision of atomic electric stations with economically justifiable fuels is also a complex problem.⁶⁵

Combined Resources emphasizes simultaneous development across the entire range of energy resources. A key objective is "optimization" of the elements composing the energy balance, measured in cost terms. This objective is qualified by recognition of the need to build sufficient "reliability" into the energy balance; that is to say, the need to select a production strategy that combines a low total cost with a high probability of avoiding disastrous "interruptions" in energy delivery. Combined Resources advocates are sensitive to the depletion of nonrenewable hydrocarbons, but at the same time they are aware of the potential advantages to be reaped from the USSR's current relatively advantageous position in the international energy market. They urge that this comparative advantage be deliberately taken into account in planning Soviet energy production and consumption.

Among the proponents of Combined Resources are some individuals who were at one time enthusiastic about the possibilities of natural gas. This enthusiasm has now waned, and the medium-term answer to the Soviet energy problem is conceded by them to lie with coal. Specifically, hopes are pinned on development of the truly enormous reserves of brown coal in the Kansk-Achinsk basin, as well as the much smaller deposits of subbituminous coal at Ekibastuz in Pavlodar Oblast, Kazakhstan (see map). The Kansk-Achinsk coalfields stretch some 700 kilometers along the Trans-Siberian railway, east and west of Krasnoyarsk in Krasnoyarsk Kray. They have only a shallow overburden and are thus easily strip-mined. However, the low calorific value, high water and ash content, and tendency of Kansk-Achinsk coal to self-ignite when transported without having been processed pose technical problems that give rise to major policy issues—a topic discussed below.

Legend:

- Coal basin
- Major hydroelectric station
- Power Transmission Lines
 - 500 kv AC (higher voltage lines noted)
 - 1150 kv DC
 - 1500 kv DC

Map Labels: Leningrad, Cherepovets, Volgda, Yaroslavl, Kostroma, Vladimir, Gor'kiy, Kiryov, Chusovoy, Kazan', Sverdlovsk, Tyumen', Irtysh, Omsk, Novosibirsk, Kansk-Achinsk, Kansk, Achinsk, Krasnoyarsk, Bratsk, Ust'-Ilimsk, Lena, BAM Railroad, Irkutsk, Sayan Shushensk, Abakan, Kuzbass, Berezovo thermal plant, Itatskiy, Barnaul, Ekibastuz, Karaganda, Kamenogorsk, Ust'-Kamenogorsk, Orenburg, Balakovo, Kuybyshev, Ryazan', Tambov, Volgograd, Volga, Energetik, Petropavlovsk, Siberian Railroad, Trans-Ural, Ural, Urengoy, Surgut, Megion, Angara, Bratsk, Ust'-Ilimsk, Irkutsk, Krasnoyarsk, Kansk, Achinsk, Kansk-Achinsk, Itatskiy, Berezovo thermal plant, Kuzbass, Sayan Shushensk, Abakan, Barnaul, Novokuznetsk, Ekibastuz, Karaganda, Kamenogorsk, Ust'-Kamenogorsk, Orenburg, Balakovo, Kuybyshev, Ryazan', Tambov, Volgograd, Volga, Energetik, Petropavlovsk, Siberian Railroad, Trans-Ural, Ural, Urengoy, Surgut, Megion, Angara, Bratsk, Ust'-Ilimsk, Irkutsk, Krasnoyarsk, Kansk, Achinsk, Kansk-Achinsk, Itatskiy, Berezovo thermal plant, Kuzbass, Sayan Shushensk, Abakan, Barnaul, Novokuznetsk, Ekibastuz, Karaganda, Kamenogorsk, Ust'-Kamenogorsk.

Confidential

If, in the short term, the Combined Resources advocates recognize the unavoidability of heavy reliance on oil and gas, and, in the medium term, the need for coal substitution and slow-neutron fission reactors, in the long term they visualize salvation arising from breeder reactors and fusion power.⁶⁶ Few Soviets of whatever persuasion would disagree with this general scenario. The point is, however, that in practical terms the Combined Resources strategy implies assigning high priority *today* to R&D connected with middle-term and long-term solutions to the energy production problem, and to actually commissioning Kansk-Achinsk capacities. Keeping all the balls in the air at once is the essence of this strategy; and this translates either into increasing the already high total investment in energy production or effecting a transfer of resources from hydrocarbons to other resources. []

Combined Resources advocates, of course, immediately point to the possibility of at least partially finessing this difficult choice through vigorous energy conservation measures and increased efficiency in the extraction and utilization of fuels drawn from existing deposits. A serious attempt should be made, they argue, to reduce the cost of east-to-west energy transfer by developing energy-intensive industry more vigorously in Siberia near the sources of coal and hydropower. In the European USSR there should be a more rapid acceleration of nuclear power. Recovery efforts should be intensified in the fossil fuel deposits west of the Urals, and geological prospecting here should also be strengthened. A special effort should also be made to perfect magnetohydrodynamic power generation (MHD), which—so its supporters claim—promises a substantial increase in the efficiency of thermal electric plants. It should be emphasized, of course, that none of the Combined Resources advocates are “against” oil and gas. Many of them have been involved in high-level deliberations over Tyumen development, and all take it for granted that a vigorous effort will be made to increase oil and gas production. []

Proponents and Opponents

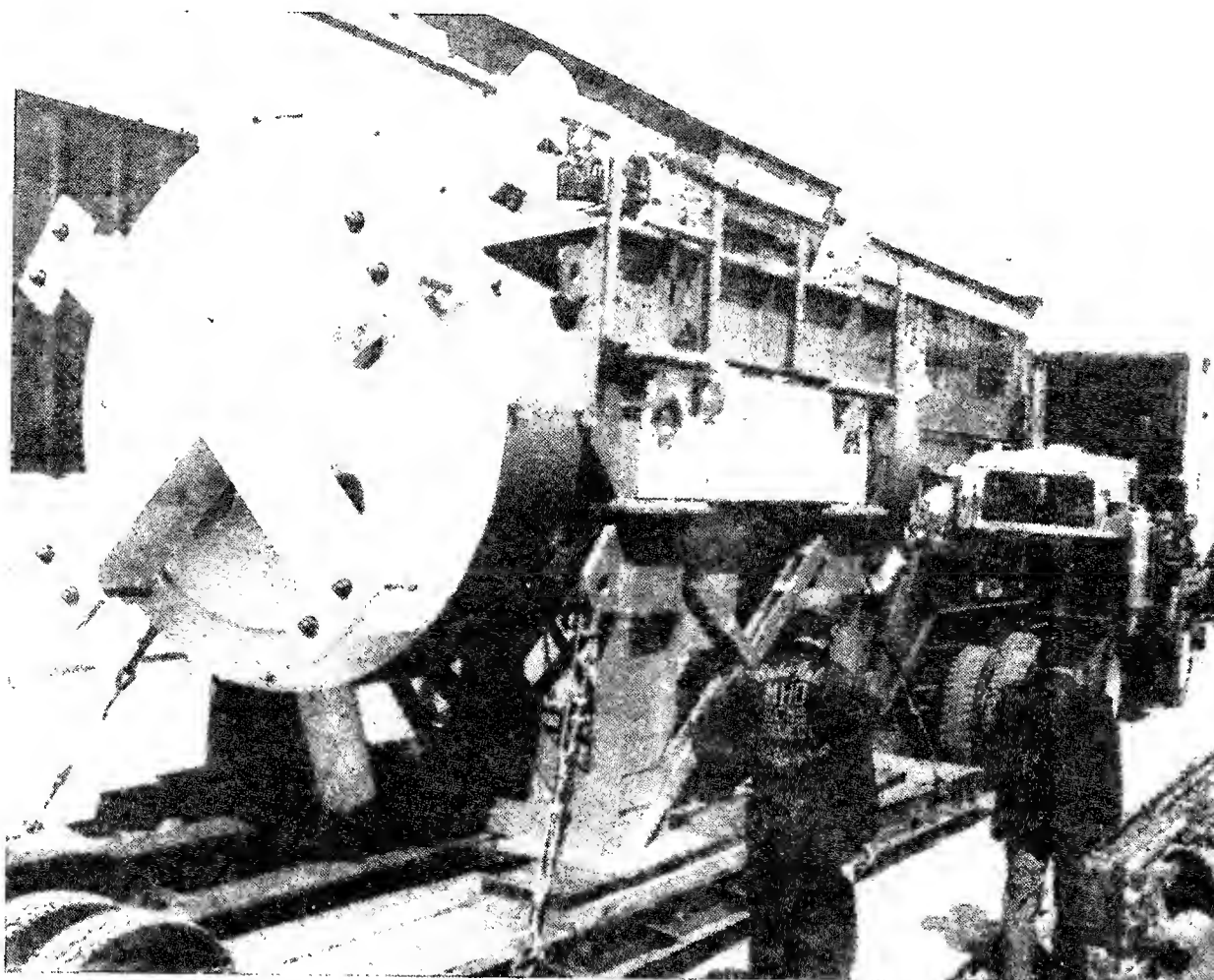
Perhaps the most important, albeit cautious, proponent of the Combined Resources approach has been Kirillin.⁶⁷ As Chairman of the State Committee for Science and Technology, and the deputy chairman in the Council of Ministers responsible for science policy,

he has been strategically located both to influence elite opinion on energy production policy issues and to participate in policymaking. Although he himself has no doubt found it prudent to adjust his own positions to accommodate the perceived views of Politburo members and influential figures in the Central Committee apparatus, officials below him have probably in turn taken cues from him—particularly when their R&D budgets have been affected by his decisions. []

Kirillin is an electric power engineer by training, and his most important personal professional commitment is to the development of MHD generators. He was the driving force behind the establishment of the Academy of Science's Institute of High Temperatures, headed by A. Ye Sheyndlin, which is the leading MHD research organization in the Soviet Union. As noted earlier, both Styrikovich and Melent'ev work in this institute, they both are also electric power engineers by profession, they both have been collaborating with Sheyndlin and Kirillin in MHD research, they both are longtime friends of Kirillin, and they both are strong supporters also of the Combined Resources approach.⁶⁸ MHD is a direct beneficiary of Combined Resources: it is funded as one of the “combined” palliatives for the energy problem, and it is now being designed with Kansk-Achinsk coal in mind as a basic fuel. Thus a situation exists in which three of the top scientific “judges” of alternative energy strategies upon whom the Soviet leadership must to some extent rely have a personal vested interest in one of these alternatives. []

The same observation applies to the President of the Academy of Sciences, Aleksandrov, who involves himself directly in long-term energy planning, and the Academy's first vice president, Velikhov, who has overall responsibility in the Academy for monitoring energy research. Both are nuclear scientists, and both have worked for years in the Kurchatov Institute of Atomic Energy—Aleksandrov as director, and Velikhov as one of his deputy directors. Thus both have a major stake in one of the other “combined” resources—nuclear power, for which Aleksandrov has publicly lobbied with great vigor.⁶⁹ []

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Delivery of a large US-produced magnet to the Institute of High Temperatures; part of the joint Soviet-American MHD research program under US/USSR Energy Agreement

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Petr Neporozhniy
Minister of Power and Electrification

The other top Academy of Sciences adviser on energy policy, Mel'nikov, has an analogous direct professional interest in the Combined Resources energy balance strategy. He has worked since the early 1930s in the coal industry as an engineer, top administrator in the Ministry of Coal, and high-level government consultant on coal mining. His particular speciality has been strip mining—a subject on which he wrote his doctor's dissertation. Late in 1977 he was appointed director of the Institute of Problems of Complex Mastery of Mineral Resources of the Academy of Sciences, confirming his status as the key figure for strip mining in the Academy. In his policy-influencing role of chairman of the Academy's Commission for the Study of Production Forces and Natural Resources, it would be surprising if he has not urged what promises to be the largest strip-mining operation in world history; he has certainly advocated coal and Kansk-Achinsk development in his public statements.⁷⁰

Mel'nikov has been linked with two other sources of support of Combined Resources outside the Academy of Sciences: the Ministry of Power and Electrification and the Ministry of Coal. The Minister of Power and Electrification, Petr Neporozhniy, has—not always consistently—backed coal substitution and Kansk-Achinsk development as well as nuclear power. Zinovii Chukhanov, based in the Ministry's leading Krzhizhanovskiy Institute of Power Engineering, has—as noted above—been the most single-minded advocate of Kansk-Achinsk, with which his role as a scientist has become inextricably linked.⁷¹ The Minister of Coal, Boris Bratchenko, has also strongly supported Kansk-Achinsk, although he—like Neporozhniy—has emphasized the technical and developmental obstacles that must be surmounted before its potential can be realized. And A. A. Krichko, director of the Ministry of Coal's Institute of Fossil Fuels, has likewise backed Kansk-Achinsk.

25X1

This core of advocates of the Combined Resources strategy has received support from some individuals in Gosplan, including Baybakov and Yatrov, director of the All-Union Scientific Research Institute of Complex Fuel-Economic Problems; from Krasnoyarsk party officials; and probably from some figures in the Central Committee apparatus. It would not be unreasonable to suppose, in particular, that Central Committee Secretary Dolgikh, the former first secretary of Krasnoyarsk kraykom, has taken at least some interest in Kansk-Achinsk. And Premier Kosygin has clearly identified himself with major elements of the Combined Resources line over the years.

25X1

Visible opposition to the Combined Resources strategy, as already noted, has been concentrated among the most committed advocates of Tyumen development: Tyumen party officials like Bogomyakov, and the Minister of Construction of Petroleum and Gas Industry Enterprises, Shcherbina. There have also been specialists in Gosplan and elsewhere who have doubted the economic rationality of transmitting

X1 Kansk-Achinsk power to the West, and who have argued that it should be employed solely in energy-intensive industry in Siberia.⁷² The articulation of this point of view in 1973 in the party's theoretical journal, *Kommunist*, strongly suggests that it has some support within the Central Committee apparatus.⁷³ So does the effective scuttling of the 10th Five-Year Plan line at the end of 1977. [redacted]

Issues

Many of the arguments in favor of the Combined Resources strategy have already been indicated above. At the most fundamental level, Combined Resources responds to the insistent question: What happens after there is no longer enough oil and gas? In the shorter term, its supporters claim that it promotes the party leadership's oft-proclaimed goal of cost effectiveness. This point has been stated in its most extreme form by Chukhanov, who argues that only in coal do "threshold reserves" remain—"those reserves of fuel, the extraction, processing, transportation and use of which without polluting the environment above defined permissible concentrations does not lead to ruin of the country, to regression, to a cessation of growth in real national income."⁷⁴ But cost effectiveness is a key gain also said to be achieved from the optimizing models generally favored by Combined Resources advocates. Still another basic advantage of the Combined Resources approach, so its proponents claim, is the greater security it provides. On the one hand, it prevents long-term developmental imperatives from being swamped by short-term supply needs; on the other, it produces the most rational course of action in the face of differential probabilities of failure in various areas of energy production.⁷⁵ [redacted]

X1 Finally, the Combined Resources approach is probably presented by its supporters as having definite advantages for the USSR in the international arena. Styrikovich has stressed the possibility it provides for capitalizing (for example, through gas sales) on the world energy shortage.⁷⁶ Mel'nikov, quoting Kosygin's praise at the 25th Party Congress for the Soviet Union's energy independence, has noted the great vulnerability of Western countries to price fluctuations in the world market—something the USSR has avoided.⁷⁷ Combined Resources proponents might also

argue—although they have not done so in public—that coal production, thermal power generation, nuclear power and hydroelectricity—in contrast to oil or gas production—are areas in which future progress is substantially less dependent on Western technology, materials, or credits, and more suited for participation by the Council of Mutual Economic Assistance (CEMA)—and Chukhanov has, by implication, publicly justified Big Coal in terms of the need to maintain strategic oil reserves.⁷⁸ [redacted]

25X1 But the Combined Resources strategy has its problems too. The central dilemma that confronts it is one of funds and time. Can an approach with a longer range perspective, one that stresses development across all energy sectors and calls for a heavy commitment of resources to energy R&D, cope with the urgent demands for more oil and gas next year? Is there sufficient slack in the system to sustain the strategy in the face of unanticipated setbacks or declines in oil and gas production? In a worsening economic climate, can more resources be provided to cover the day-after-tomorrow's energy needs and from whom will they be taken? [redacted]

25X1 Whatever the final costs of a Combined Resources energy strategy may be, *today's* costs will be higher. Combined Resources call for rapid development of West Siberia and Kansk-Achinsk, plus heavier investment in nuclear power R&D. While aiming at optimization at the margin of all energy sources, this strategy runs the risk of a diffusion of effort and delay down the line; of simply being swallowed up by the forces of "departmentalism" and bureaucratic inertia, against which—some might argue—only the time-honored technique of highly focused "campaigns" has any prospect of success. [redacted]

25X1 The Combined Resources strategy is also confronted with serious technical difficulties. There are problems and choices to be made in both the nuclear and MHD programs.⁷⁹ Construction of the "Atomash" plant, designed for series production of nuclear power plant components, is lagging behind schedule. But most critical for the ultimate prospects of the Combined Resources strategy have been the intractable dilemmas of Kansk-Achinsk coal. [redacted]

Kansk-Achinsk is located over 3,200 kilometers from Moscow and 1,600 km from the Urals industrial region. If the energy from the coal is to be transmitted west on a scale capable of seriously affecting the Soviet energy balance, a massive transportation problem must be solved. Further, the poor quality of Kansk-Achinsk coal, like that of Ekibastuz, has created major boiler problems when attempts have been made to burn it in existing power plants, and consequently its widespread use as a boiler fuel is contingent upon serious parallel R&D efforts in power plant technology. 25X1

A variety of strategies have been proposed to cope with these difficulties. It has long been evident that processing Kansk-Achinsk coal in *some* manner before it is used would be desirable, and a number of alternatives have been suggested: the conversion of the coal into an enriched and transportable "semicoke" through the pyrolysis technique championed by Chukhanov; drying; gasification; and liquefaction. Whether the coal is or is not processed, there is the option of building enormous mine-mouth power plants and then transmitting Kansk-Achinsk energy west as electricity over long-distance, superhigh-voltage lines, or—in the more remote future—through underground superconductive cables. 25X1

The first difficulty with this option, however, is designing 800-megawatt units for the power plants that will run on Kansk-Achinsk coal. More problematic still is the actual power transmission: in order to make it economically feasible to send power to the Urals and European USSR, Soviet power engineers must successfully design and produce a 4,000-kilometer, 2,200-kV DC superhigh-voltage system, after having first successfully tested a still-to-be constructed novel 1,500-kV DC line from Kazakhstan's Ekibastuz coalfield to the European USSR. Alternatively, processed coal could be physically shipped west. The main variants considered here have been construction of a separate railway all the way from Kansk-Achinsk to the European USSR, slurry pipeline, and capsule pipeline. 25X1

Developments

In contrast with the Hydrocarbon and Big Gas strategies, controversy over Combined Resources has taken place somewhat more within the Academy of Sciences, State Committee for Science and Technology, and Gosplan institute arena than among production ministries, and its ups and downs have so far had more of an effect on stated policy intentions than upon the actual allocation of resources, although as a strategy it does immediately affect not only the scientific establishment but also the basic interests of the Ministry of Coal, Ministry of Power and Electrification, and Ministry of Power Machine Building. 25X1

As early as 1969-70, during the formulation of the Ninth Five-Year Plan (1971-75), some authorities are 25X1 convinced that the existing policy of reliance upon oil and gas in the energy balance was wrong, and to have begun to lobby for a resurrection of coal. It is stated that this group, which used the Transport Commission of the Academy of Sciences as a vehicle to express its opinion, included Mel'nikov, Styrikovich, the chairman of the Transport Commission, Academician Gorinov, several of his assistants, the Minister of Coal, Bratchenko, an economist in the Ministry of Coal, Galperin, Chukhanov from the Ministry of Power and Electrification's Krzhizhanovskiy Institute of Power Engineering, Nekrasov from Gosplan's SOPS, and a party official, Pavel Kovanov. This group is said to have prepared a long report that was sent to the Politburo at the end of 1969. The report argued that oil and gas should be conserved as valuable chemical raw materials and not burned as fuel. Instead, Kansk-Achinsk should be developed. When the proposal was examined, however, it was discovered that the cost in investment funds and steel was exceedingly high. 25X1

X1 Accordingly, the Politburo issued a decision in 1970 that Kansk-Achinsk development should be put off for 20 to 25 years, that the problem nevertheless should continue to be studied, and that if, in the meantime, a mode of transportation cheaper than those currently available was discovered then the question could be reopened. This decision was perceived as a defeat by proponents of change in the energy balance, but they did see the possibility of reversing the decision through a technological breakthrough. The Politburo decision was reflected in the Ninth Five-Year Plan (1971-75), which—as noted above—maintained the stress on oil and gas in the energy balance, and also failed to mention Kansk-Achinsk, although it did refer to construction of a 4,000-megawatt power station at Ekibastuz. [redacted]

X1 This rebuff did not deter advocates of a change in Soviet energy policy. In 1973, Melent'ev's department in the Academy of Science's Institute of High Temperatures prepared a major study on nuclear power, which included an examination of the availability of all forms of energy over the next decade and the next 25 to 100 years. The study recommended conservation of petroleum resources, cessation of further building of hydroelectric stations, and an intensive program of nuclear power station construction. These conclusions were brought to Kosygin's attention.⁸⁰ [redacted]

X1 In February 1974, Styrikovich stated that he had recently completed a nationwide tour of the USSR to survey fossil fuel requirements and reserves. The emphasis he placed upon Kansk-Achinsk coal left no doubt as to what his recommendations had been. The time framework of anticipated Kansk-Achinsk development was left ambiguous: [redacted]

X1 [redacted] It was clear that no decision had been reached on how to transmit the energy. The solution preferred by the Institute of High Temperatures (namely, by Styrikovich and Melent'ev) was said to include conversion of the coal to semicoke using Chukhanov's pyrolysis technique, briquetting of part of the output for rural heating purposes, and then—at least in the initial states of development—rail transportation of this upgraded product. It was stated

that the European USSR would have to be using some semicoke for electric power generation by 1985. [redacted]

These views squared with those expressed in an article published by Styrikovich at about this same time. In the article, Styrikovich called for a "maximum forcing" of Ekibastuz in the period up to 1980-85 and a simultaneous "forcing" of Kansk-Achinsk to prepare it to assume a major share of the coal production burden thereafter. He expressed serious reservations about the possibility of mastering 2,200- to 2,400-kV DC superhigh-voltage transmission technology (or more exotic superconductivity variants), and pushed instead for a crash program of developing the semicoke process, with the output then being shipped west either by a new "coal supermainline railway," or by "various types of pipelines."⁸¹ [redacted]

Styrikovich's recommendation that Kansk-Achinsk be developed was probably taken into account in a Baybakov directive of early 1974 which ordered SOPS and all the relevant Gosplan departments to draft preliminary plans for developing this coal basin over the 15-year period 1976-90. In contrast with Styrikovich's apparent position, the directive spoke only of the use of Kansk-Achinsk coal to generate electrical energy for a large energy-intensive industrial complex that would be created in the region of the coal basin itself.⁸² [redacted]

Throughout the rest of 1974 and 1975, the Combined Resources strategy gained further momentum, with steeply rising world oil prices and Western economic disarray providing an additional strong impetus. At an important General Assembly of the Academy of Sciences devoted to energy questions that was held in November 1974, top science administrators all argued for a change in direction of Soviet energy production policy.⁸³ Mstislav Keldysh, then President of the Academy of Sciences, lent his support to an increase of coal's share in electricity production, and to MHD, breeder reactors, and fusion power. Kirillin, who gave the main report, argued that while the old stress on oil and gas in the energy balance *had* been correct in the

past, there should now be a switch to strip-mined coal as the fuel for base-load power generation. R&D work on 2,200- to 2,400-kV DC power transmission should be speeded up. In the opinion of a "majority" of specialists, Kirillin stated, broad-scale construction of breeder reactors could begin after 1985.⁸⁴ Styrikovich called for research on coal gasification and, as he put it, "agitated" for heavy investment in studies on pollution control. And Aleksandrov presented a key policy statement on nuclear power development. []

In March 1975, a year after the Gosplan directive noted above, a meeting of advisory councils of Kirillin's State Committee for Science and Technology and the Academy's Council on Complex Problems of Electric Power was held, at which the long-range intention of building eight 6,400-megawatt power stations at Kansk-Achinsk was announced and plans for boiler design discussed. It was stated on this occasion that "the first generating units should be put into operation at the end of the 10th Five-Year Plan."⁸⁵ Later in 1975, Styrikovich noted that the Academy of Sciences' Division of Physical-Technical Problems of Power had "reviewed and formulated recommendations on forcing the extraction and processing of coal from the Kansk-Achinsk coal basin, and creating power machinery intended to utilize this coal."⁸⁶ Styrikovich, Kirillin, Mel'nikov, and other speakers also justified a switch to coal at an invitation-only "public" meeting on energy policy that was held in 1975. []

These expressions of support for Kansk-Achinsk development presaged a major shift in Soviet energy policy that was announced at the 25th Party Congress and later confirmed in the 10th Five-Year Plan. In essence, what we have labeled the Combined Resources strategy was officially approved as the party line on energy production in March 1976 (when the party congress was held) and October (when the five-year plan was finally presented). []

Kosygin stated at the party congress that it was necessary to prepare to shift the energy balance away from oil and gas toward "hydroelectricity, atomic fuel, and cheap coal"; that Ekibastuz and Kansk-Achinsk coal would begin to play a significant role in power generation even before 1980; that intensified nuclear

power station construction in the European USSR would be combined with rapid construction of coal-burning power plants in Siberia and transmission of electricity to the West over the Single Electric Power grid; and that "a number" of large thermal power stations in the Urals and Volga regions would be converted from oil to coal. Subsequently this line was articulated by many authorities through 1977.⁸⁷ []

Yet even while the new line was being confirmed, doubts were being expressed that it would in fact be implemented. At the 25th Party Congress, Minister of Coal Bratchenko strongly supported Ekibastuz and Kansk-Achinsk, but observed:

In the CC CPSU's draft for the 25th Congress, development of the Kansk-Achinsk basin is projected. But in the calculations of the five-year plan resources have still not been provided for beginning construction of new facilities. We request that, in revising the plan for 1976-80, Gosplan USSR allocate the necessary material and financial resources, bearing in mind that it takes 10 to 15 years to create enterprises in new, unpopulated regions. Accelerated development of the Kansk-Achinsk basin will have a fundamental influence on the structure of the fuel-energy balance of the country and will greatly reduce the consumption of liquid fuel.

His doubts were seconded at the party congress by Minister of Power and Electrification Neporozhnyi, who pointed to the absence of a long-term development program for Kansk-Achinsk and remarked:

It is planned to create unique high-voltage electrical transmission lines of 1,150 kV AC and 1,500 kV DC for further formation of the Single Electric Power system of the Soviet Union and transportation of large flows of cheap electrical energy from Siberia to the central regions of the country. The world [sic] has not yet solved such problems. []

X1 Over the years preceding the 25th Party Congress, ambitious forecasts had suggested that by 1980 Kansk-Achinsk would be producing at least 300 million tons of coal, and by the early 1990s up to 1 billion tons.⁸⁸ Yet progress has been slow. The lack of any sort of comprehensive plan for Kansk-Achinsk development is a complaint that was voiced not only before the 25th Congress, but after as well.⁸⁹ Apart from the usual lack of horizontal coordination and the display of narrow ministerial interests, the key reason for the lack of a program has been the inability of policymakers to reach a decision on the basic issue of how to transport and use Kansk-Achinsk coal. [REDACTED]

25X1 During 1975 and 1976, and probably more recently as well, a heated debate over this issue is said to have been conducted in the Permanent Commission of Gosplan and the Academy of Sciences of the USSR on the Problem of Extraction, Transportation, and Utilization of Coal from the Kansk-Achinsk Basin. The commission is chaired by Mel'nikov, but actually run by Academician Gorinov who—as noted above—is also chairman of the Academy of Sciences' Commission for Transport Problems. [REDACTED]

25X1 [REDACTED] four different transportation variants were pushed within the commission. The Ministry of Electricity proposed building large pit-head power stations in Kansk-Achinsk and then transporting this energy by high-voltage line to the European USSR; the Ministry of Railroads proposed building a special railway to the Center for coal transportation; Gorinov, Mel'nikov, and others backed a slurry or capsule pipeline; and a group of Leningrad scientists suggested construction of a large coal gasification facility that would send coal-derived liquefied hydrogen and electric power through a superconductive *cum* hydrogen pipeline to the west (a solution that would probably take decades to implement). [REDACTED]

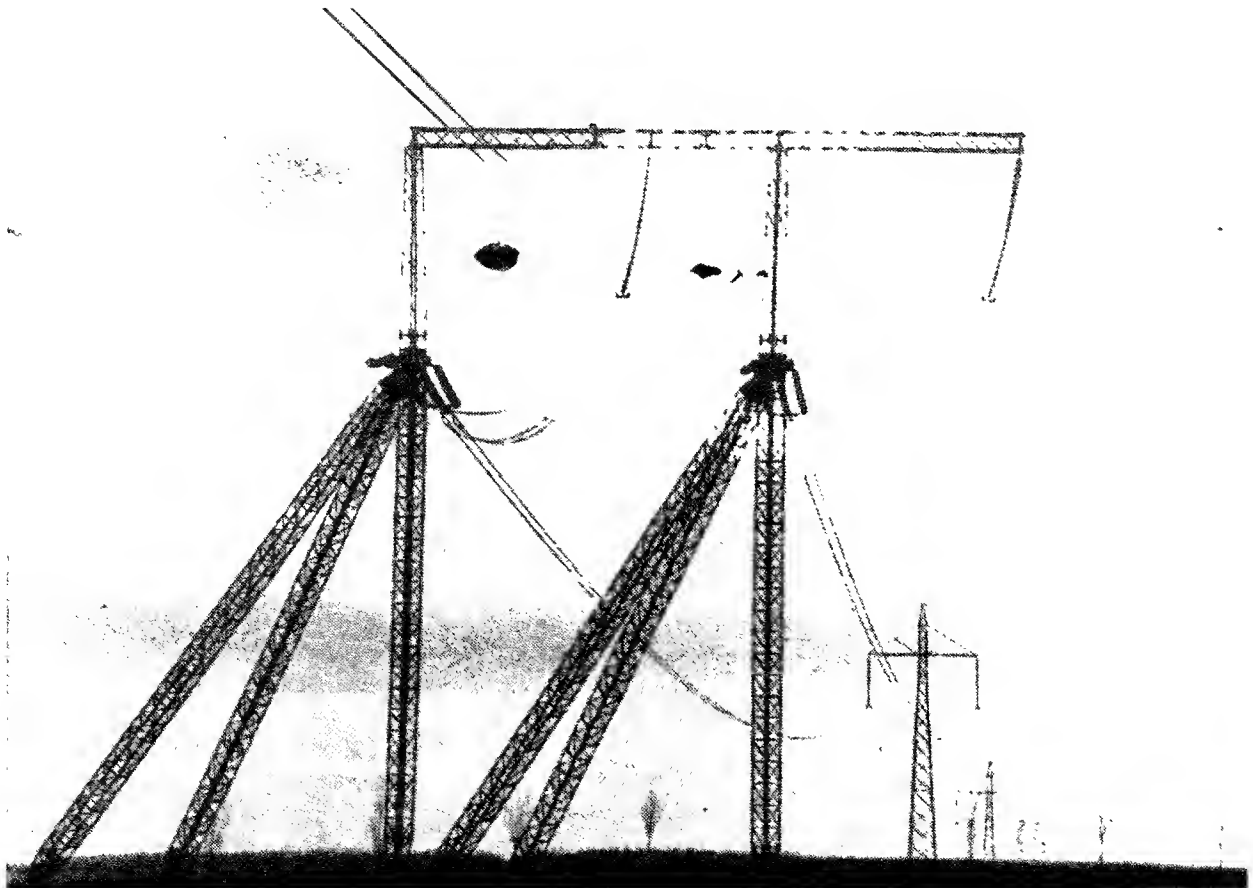
5X1 [REDACTED] this broad range of alternatives was being discussed in 1976, and indeed had been under discussion for some years. A key question has been the technical feasibility and relative cost advantage or disadvantage of superhigh-voltage transmission of electrical energy over the long distances from Ekibastuz and Kansk-Achinsk to the Center. The problem here has been, first, to design and build a 1,500-kV DC line from

Ekibastuz to the Center; second, to build the 1,150-kV AC line, in order to distribute future Kansk-Achinsk power within central Siberia and to link Kansk-Achinsk with the Kazakhstan power grid, permitting a flow of Kansk-Achinsk power to the Urals or European USSR; and third, relying on the experience of the 1,500-kV DC line, to design and build a 2,200- to 2,400-kV DC line directly from Kansk-Achinsk to the Center. Technically, these are extremely difficult tasks; the world's longest and most powerful DC line currently in operation is an 800-kV line on the US West Coast. [REDACTED]

25X1 Solving the technical problem of superhigh-voltage transmission has been an elusive goal. Back in 1966, Mel'nikov declared that Soviet scientists had to solve the problem "within three years" in order to begin exploiting Kansk-Achinsk coal in the Ninth Five-Year Plan (1971-75). Five years later, Kosygin endorsed construction of 1,500-kV DC and 1,150-kV AC lines *during* the Ninth Five-Year Plan (1971-75). Another five years later, the directives for the 10th Five-Year Plan demanded that production of the equipment for the 1,500-kV DC and 1,150-kV AC systems be mastered before 1980, but set no targets for a 2,200- to 2,400-kV DC line. [REDACTED]

25X1 Some high-level energy advisers have evidently become increasingly doubtful that the problem of superhigh-voltage transmission, especially 2,200- to 2,400-kV DC transmission, can be solved in the foreseeable future. In 1973, for example, Styrikovich asserted that "by the beginning of the 1980s" the first "1,500- to 2,200-kV DC line" would begin operation. In 1974, however, he pessimistically observed that the transmission of electrical energy 3,000 to 4,000 kilometers

demands the creation either of superhigh-voltage DC lines (2,200 to 2,400 kV), or a shift to fundamentally new methods of transferring electrical energy (cryogenic-resistance or superconductive cables, etc.). Neither the one nor the other task has been solved anywhere in the world even at small-scale experimental installations, and it is difficult to guess the period of time needed and cost of a solution to these problems.



The Volgograd-Donbass 800-kV DC Transmission line, the highest voltage powerline in the USSR

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Moreover, in the long run, when AESs [Atomic Electric Stations] and ATETs [Atomic Heat and Electric Stations] become the foundation of electric power for the entire European part of the country, the mass transport of energy resources over such a great distance will lose its immediacy.⁹⁰

By 1975 he was barely mentioning the subject. As indicated above, his preferred solution to the problem has apparently been the conversion of Kansk-Achinsk coal into semicoke and its transportation west either by rail or pipeline. [REDACTED]

Other top-level advisers hope, on the contrary, that the long-distance, superhigh-voltage transmission problem can be solved. Their public statements suggest that Melent'ev, Aleksandrov, and perhaps Kirillin are somewhat more optimistic than Styrikovich on this score.⁹¹ In 1977 Aleksandrov declared that he was "very pleased to announce" that the technical obstacles preventing construction of the 1,500-kV DC Ekibastuz-Center line had been overcome, making possible not only the transmission of power from Kazakhstan to the European USSR, but "in the next stage" construction of a Kansk-Achinsk-Center line.⁹² Melent'ev observed in 1977 that transmission of power from Kansk-Achinsk to the Center over a superhigh-voltage DC line was a key element in transferring energy from east to west in the USSR, and that it could

X1 not be supplanted by railway or pipeline transport or by the construction of nuclear power plants in the west. Moreover, Melent'ev suggested, ecological factors would in time dictate the location of new thermal and nuclear power plants at a distance from consumers, making long-distance DC transmission technology all the more indispensable.⁹³ [redacted]

X1 Construction of a special railroad, as indicated above, has been considered as an alternative to the transmission of electrical energy from Kansk-Achinsk. References to the railroad option have appeared for a decade, often expressed by specialists associated with railway transport—including Gosplan's Institute for Complex Transport Problems.⁹⁴ This variant has been mentioned, along with electrical energy transmission and pipeline transport, by Kirillin.⁹⁵ As recently as February 1977 the director of the Leningrad Scientific Research Institute for Direct Current found it necessary to refute the argument, "wouldn't it be more profitable to send the fuel by railway?" even in the context of defending the more tractable Ekibastuz 1,500-kV line.⁹⁶ [redacted]

X1 Pipeline transportation of Kansk-Achinsk energy has apparently been pushed especially hard by Shcherbina, the Minister for Pipeline Construction, by Gosplan Deputy Chairman Lalayants, and by Baybakov's energy adviser in Gosplan's State Experts' Commission, Bokserman, although it has also been supported by the State Committee for Science and Technology. The main argument in its favor has evidently been that pipeline transportation is far cheaper than either long-distance electrical transmission or railway transport. Before the 10th Five-Year Plan was adopted, both Shcherbina and Bokserman publicly supported capsule pipeline transport, and Bokserman claimed that this mode was only a third the cost of railway shipment of coal. [redacted]

X1 Attention has also been paid to slurry pipeline transport.⁹⁷ In March 1977 it was announced that a group of scientists from Donetsk had worked out recommendations for building a slurry pipeline up to 4,000 kilometers long from Kansk-Achinsk to the European USSR, which would deliver coal at 10 times the speed of rail transport and at lower cost. And in September 1977, Gosplan Deputy Chairman Lalayants headed a

slurry-pipeline delegation to the United States.

[redacted] the Soviets planned to build a slurry pipeline 2,000 kilometers long, with a capacity of 75 million metric tons per year. Such a line would presumably be a test before the Kansk-Achinsk-Center line was undertaken.⁹⁸ Before this pipeline is built, however, an initial experiment will be made with a 250-kilometer slurry pipeline designed to move coal from the Kuzbass to a power plant in Novosibirsk. Preliminary calculations are also being made on a 25-million-ton-per-year Kuzbass-Urals line. [redacted]

Gosplan supported slurry pipelines, Lalayants stated, in order to promote conversion by industrial users from oil to coal. It probably supported the project too because it may well have been convinced by the deliberations of the joint Gosplan and Academy of Sciences Permanent Commission on Kansk-Achinsk that pipeline transport *was* demonstrably the cheapest way to move Kansk-Achinsk energy. But there may have been a personal reason as well. Gosplan Chairman Baybakov's son, Sergey, is deputy director of the institute responsible for designing the slurry pipeline system, and Baybakov senior is said to have backed the project to support his son's career ambitions, interceding personally with Kirillin to secure R&D funding for it.⁹⁹ [redacted]

X1 It is apparent that solutions to the problem of transporting Kansk-Achinsk energy are not imminent. According to Chukhanov, this situation is explained by a fixation for many years on oil: "Even in the USSR Academy of Sciences for 15 years now all the most important scientific research on solid fuels has been almost completely eliminated."¹⁰⁰ [redacted]

X1 The notion that Kansk-Achinsk development would make any significant contribution to the Soviet energy balance before 1980 was evidently discounted almost immediately after the five-year plan was adopted—if not beforehand—by such key figures as Minister of Coal Bratchenko, Minister of Power and Electrification Neporozhnyi, and Baybakov himself.¹⁰¹ The de facto strategy that has emerged since 1975 has been to press ahead on Ekibastuz coal extraction, to assign priority to design and construction of the 1,500-kV DC Ekibastuz-Center transmission line, to develop very gradually the third extraction site in Kansk-Achinsk (the Berezhovo coalfield), and to look in the medium run toward a linkup of Kansk-Achinsk with the Kazakhstan power grid by means of a 1,150-kV AC line—which would permit a roundabout transfer of Kansk-Achinsk power at least to the Urals until the Ekibastuz-Center line goes into operation.¹⁰² [redacted]

X1 Not surprisingly, discussions of Kansk-Achinsk since 1976 exhibit considerable ambivalence. The decision in the 10th Five-Year Plan to go ahead with Kansk-Achinsk, even though the transportation issue remained unresolved, has led some authorities to redefine the central function of Kansk-Achinsk by emphasizing its role as the hub of a vast energy-intensive industrial complex to be formed right in Krasnoyarsk Kray. This point of view, which has been publicly articulated by Mazover and Nekrasov of Gosplan's SOPS, implies an extremely bullish attitude toward Siberian industrial development, but by the same token suggests that Kansk-Achinsk coal will not solve the critical European USSR fuel deficit in the foreseeable future.¹⁰³ Meanwhile, others—including some Gosplan officials—continue to emphasize transportation west of Kansk-Achinsk energy.¹⁰⁴ [redacted]

In practice, progress has been achieved in Ekibastuz during the present five-year plan, and it is claimed that the technology of 1,500-kV DC transmission has now been mastered and that actual construction of the line is about to begin. Reports from Kansk-Achinsk, however, indicate that while a few broad output targets have been set, no comprehensive development program existed at all, even in 1977.¹⁰⁵ Despite efforts by the Krasnoyarsk obkom to generate such a program and to establish some mechanism for coordinating the activities of the dozens of agencies involved in developing Kansk-Achinsk, the familiar pathology of malcoordination at the regional level has persisted. Each ministry goes its own way, guided by its own vested interests, and vital long-term development needs are simply ignored.¹⁰⁶ There is no evidence that the leadership in Moscow was prepared to intervene decisively in the period leading up to the December 1977 Plenum of the Central Committee in order to change this situation. [redacted]

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Soviet Energy Production Alternatives

Strategy	Hydrocarbons	Big Gas	Big Coal	Combined Resources
	<p>Maintain or increase the combined share of hydrocarbons in the fuel-energy balance, with particular emphasis upon oil production.</p> <p>Concentrate investment on Tyumen Oblast of West Siberia. Accelerate oil production in the Middle Ob region and production of natural gas in the northern region of Tyumen, while aggressively seeking new giant oil deposits at lower levels in the Middle Ob and beneath the gasfields in the north. Rapidly expand exploration for new oilfields along the Arctic shelf and in East Siberia.</p>	<p>Capitalize on the one energy branch in which the available resource base and level of existing technology could conceivably permit a relatively rapid increase in output and shift in the Soviet fuel balance.</p> <p>Accelerate development of Medvezh'ye, Urengoy, and other giant gas deposits in northern Tyumen, build the pipelines needed to transport this gas to consumers.</p> <p>Make a firm decision that gas should continue to be used as a boiler fuel as well as a feedstock for the chemical and petrochemical industries. On the basis of such a decision proceed to build a series of large gas-fired thermal generating plants in Tyumen, and transmit the power produced to the Urals and European USSR over extrahigh-voltage lines.</p>	<p>Reverse the trend toward hydrocarbons in the fuel balance through coal substitution.</p> <p>Rapidly develop strip mining in the Ekibastuz field of northern Kazakhstan and, above all, in the enormous Kansk-Achinsk brown coal deposits of Krasnoyarsk Krai in central Siberia.</p>	<p>Adopt an integrated approach to research, development, and exploitation of all basic energy sources, aimed at cost optimization of energy production.</p> <p>Pursue a resource allocation pattern intended to guarantee a timely shift in the energy balance toward coal and conventional fission power in the mid-term, and then breeder reactors, and (finally) fusion power in the more distant future.</p> <p>Exploit the USSR's comparative international energy advantage by means of hydrocarbon exports, but reduce foreign technological dependence and ensure long-run energy self-sufficiency based on coal and nuclear power.</p>
Proponents	<p>A Tyumen-based grouping (the Tyumen obkom first secretary, Bogomyakov; the obkom second secretary, Shmal'; the chief of the Tyumen Geological Administration, Salimov; and numerous lesser Tyumen production-level and institute personnel).</p> <p>The Ministry of Construction of Petroleum and Gas Industry Enterprises, led by the former Tyumen obkom first secretary, Shcherbina.</p> <p>The Siberian Division of the Academy of Sciences, and especially its deputy head and director of the Institute of Geology and Geophysics, Academician Trofimuk.</p> <p>The head of Gosplan's Council on Production Forces (SOPS), Nikolay Nekrasov.</p> <p>Central Committee apparatus officials, with possible support on occasion from Dolgikh, Kirilenko, and even—perhaps—Brezhnev.</p>	<p>Shcherbina, the Minister of Construction of Petroleum and Gas Industry Enterprises.</p> <p>Tyumen political, economic, and institute officials (the same group supporting the Hydrocarbon strategy, plus some individuals in the gas industry).</p> <p>The head of Gosplan's SOPS, Nekrasov.</p> <p>Gosplan Chairman Baybakov; the deputy chairman of Gosplan's State Experts' Commission, Bokserman; and Kosygin's energy referent Popyrin (in the early to mid-1970s).</p> <p>Some leaders in the Academy of Sciences (notably the head of the Yakutsk branch of the Academy, Cherskii; to a certain extent the President of the Ukrainian Academy of Sciences, Paton, and—in the early 1970s—some of the later supporters of the Combined Resources approach).</p>	<p>A cluster of officials and scientists associated with the coal and electric power industries (Minister of Coal Bratchenko, Minister of Power and Electrification Neporozhnyi, Academician Mel'nikov, coal pyrolysis expert, Chukhanov).</p> <p>Krasnoyarsk Krai party and economic officials.</p> <p>Gosplan Chairman Baybakov and head of Gosplan's Institute for Complex Fuel-Energy Problems, Yatrov (to some extent).</p> <p>Kosygin (partially).</p> <p>Central Committee secretary and former Krasnoyarsk kraykom first secretary, Dolgikh (to some extent, possibly).</p>	<p>Kosygin.</p> <p>Virtually the entire top level of the Academy of Sciences' energy experts: President of the Academy Aleksandrov, Vice President Velikhov, Styrikovich, Melent'ev, and Mel'nikov.</p> <p>Chairman of the State Committee for Science and Technology and Deputy Chairman of the Council of Ministers Kirilin.</p> <p>Gosplan Chairman Baybakov and head of Gosplan's Institute for Complex Fuel Energy Problems, Sergey Yatrov.</p> <p>Minister of Coal Bratchenko and Minister of Power and Electrification Neporozhnyi.</p> <p>Krasnoyarsk Krai party and economic officials.</p>
Problems	<p>Failure to discover any new supergiant oilfields in Tyumen and elsewhere in the USSR.</p> <p>Uncertainty and controversy over the size of oil reserves remaining in Tyumen. Insufficient geological exploration in Tyumen and East Siberia.</p> <p>Achieving an optimum balance between resources invested in West Siberia and in the older, more depleted oil regions east of the Urals.</p> <p>Development of many small, less accessible and less productive oil deposits in Tyumen to compensate for declining production elsewhere and the peaking of the largest Tyumen oilfield, Samotlor.</p> <p>Huge investment costs required in production facilities, pipelines, and infrastructure, given the remoteness and harsh environmental conditions of Tyumen.</p>	<p>The high cost of pipeline construction and the amount of steel required to produce a quantum leap in gas transportation.</p> <p>Hard currency constraints on the purchase abroad of pipeline and compressors.</p> <p>Delay in research and development aimed at lowering the cost of gas transport.</p> <p>Controversy over pipeline routes, connected in part with technical difficulties presented by permafrost.</p> <p>Controversy over use of natural gas as a boiler fuel.</p>	<p>Enrichment of Kansk-Achinsk coal to upgrade its transportability and burning properties.</p> <p>Transportation of the energy to be derived from Kansk-Achinsk and Ekibastuz coal: by rail, pipeline, or high-voltage transmission from mine-mouth generating plants. Investment costs of each of these alternatives are enormous, and pipeline or high-voltage transmission require fundamental research and development breakthroughs.</p> <p>Conversion of old power plants and development of a new generation of equipment capable of efficiently burning Kansk-Achinsk coal.</p> <p>Development of a new center of energy-intensive industry in Krasnoyarsk Krai based on Kansk-Achinsk coal.</p>	<p>The high cost of advancing simultaneously along the entire energy front.</p> <p>Potentially inadequate responsiveness to the immediate need for oil and gas.</p> <p>All the difficulties enumerated above related to the exploitation of the Ekibastuz and Kansk-Achinsk coal deposits.</p>

USSR: Major Petroleum Deposits, Pipelines, and Coal Basins

